ENGINEERING NEWS-RECORD

DECEMBER 30, 1954

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STAFF REPORT ON OUR NATION'S MOST AMBITIOUS ROAD PROGRAM...

Eisenhower's Grand Plan

HERE ARE THE FACTS BEHIND:

- What the Administration will present to Congress
- What it means to everyone in construction

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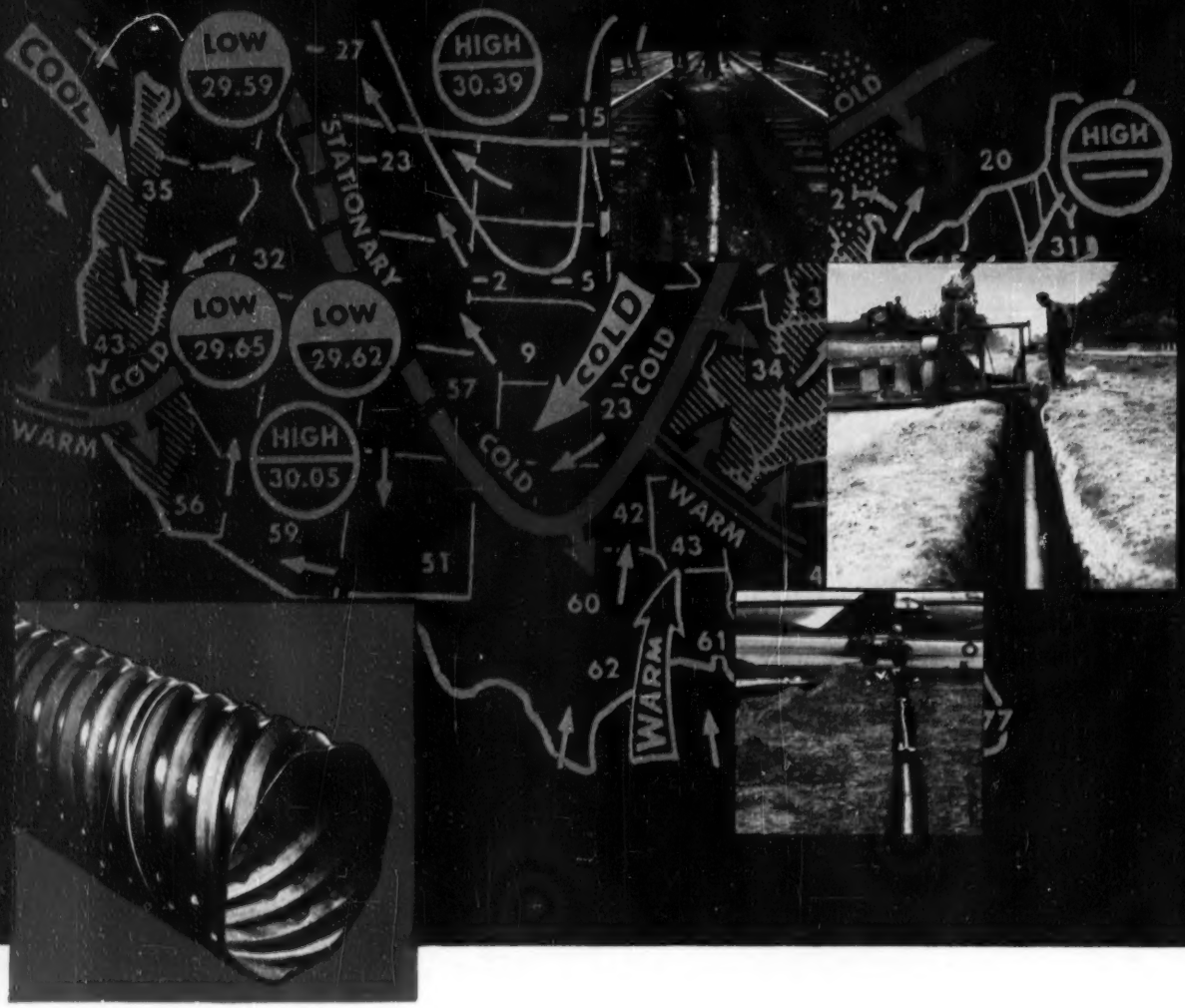

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"Wet and sloppy" meant real trouble when it applied to subgrades under highways, railways and airports. The problem was twofold.

Excess groundwater was hard to detect and in many cases the first indication was damage to expensive surface installations. More important, even when engineers knew about excess water, corrective measures were often uncertain and expensive.

Increased emphasis on soil surveys and improved techniques put the spotlight on areas having excess water. Then Armco engineers made it easy to make a positive subgrade forecast of "dry and firm." They developed HEL-COR Perforated Pipe.

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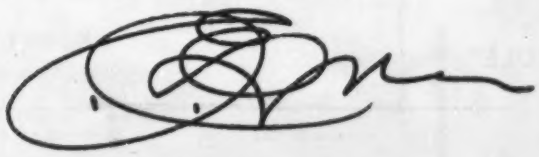
An Open Letter from Sinclair Refining Company

America needs a great many new roads, particularly in and around cities. Unbelievable amounts of time and money are lost each day because of the congested highways in urban areas. Our national strength is being sapped by the progressive hardening of our principal traffic arteries.

The time to do something is now. Long-range highway programs soundly conceived deserve the whole-hearted attention of all who believe in America's future. We should all be willing to cooperate in progressive highway development and in the advancement of all highway programs aimed at the elimination of traffic congestion. We cannot afford to do less.

Sinclair has a deep and continuing interest in the successful development of all forms of transportation and stands ready to do its part for better roads. As a user of America's highways and as a supplier of its highway needs, we will support and, where possible, aid in the hammering out of a progressive highway program, one on which all are united.

Our domestic prosperity and our national defense demand an adequate and continuing program of highway development, keeping pace with growth and change in our national economy.



J. E. Dyer, President
SINCLAIR REFINING COMPANY

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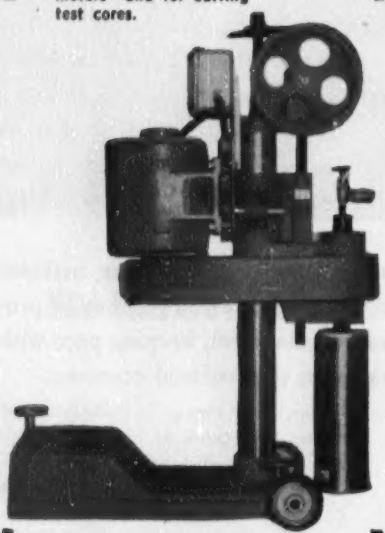

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CONTENTS ON PAGE 15

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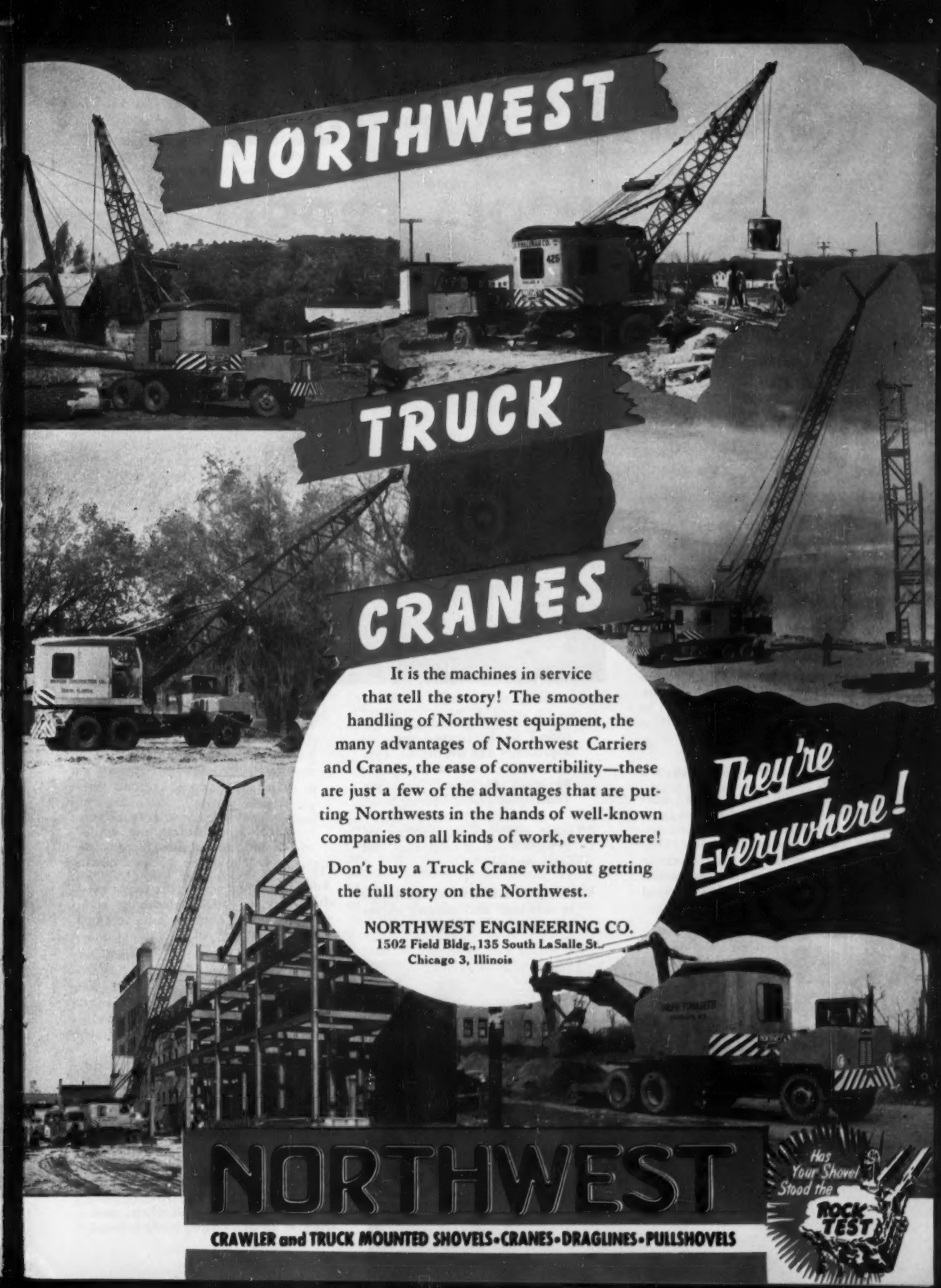
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3 well-known Turnpike contractors report...

always a profitable job for the 7-yard "D"

Scattered dirtmoving an New York Thruway

S. J. GROVES and SONS Company,

Minneapolis, assigned three 7-yd. D Tournapulls to supplement work of 13 big LeTourneau-Westinghouse crawler-drawn and self-propelled scrapers on 1,800,000 yards for the Waterloo Section of the New York State Thruway.

Despite wet, muddy conditions, the "D's" moved dirt right along on every day the crawlers could. Exclusive differential, which automatically transferred power from slipping wheel to wheel on firmest footing, took them through muck sometimes belly-deep.

"D's" handle 7 types of jobs

Most of the time, the "D's" self-loaded to economically handle a number of scattered "one-man, one-machine" assignments. This way, they kept the bigger scrapers free for major dirtmoving. And, when production work was completed, "D's" stayed behind to clean up. In all, they handled these 7 special assignments:

1. Hauled 30,000 yds. of topsoil for spread on landscaped areas of approaches and overheads. Typical output on 1000-ft. cycles: 20 loads (110 pay yds.) per Tournapull per 60-minute hour.
2. Built interchanges, hauling up to 25,000 yds. of sand, clay, and loam per job.
3. Traveled between concrete forms to self-load and remove excess gravel before paving.
4. Hauled and spread backfill around bridges and culverts.
5. Cut 6 miles of ditches.
6. Finish-graded shoulders.
7. Used cable hitch to keep motor patrol from sliding off while finishing steep side-slopes.

"D Tournapulls," says Project Supt. Andy DeSimon, "are the best machines we've had for clean-up and shoulder work! They can't be beat on this scattered type of operation."

Clean-up after paving on New York Thruway

D. W. WINKELMAN CO., Inc.,

Syracuse, following paving and shoulder grading of a 6.6 mile section of the NYS Thruway, called on their D Tournapull and a motor grader to pick up scattered accumulation of rocks and smaller debris. Grader first windrowed all rock to center of completed slab. Tournapull then came along at 20 to 25 mph, blade lowered

to "float" on the roadway. This scooped 100 to 150 ft. of windrowed stones per pass. Company officials call this the cheapest method they know to handle the material. Tournapull, they report, picks up and disposes of 3 times as many rocks in a day as front-end loader can load. Tournapull's big low-pressure tires rolled over both newly-set concrete and soft shoulders without causing damage.

Cleans between forms

On other work here, the "D" helped grade approaches on roads underpassing the Thruway. Unit usually self-loaded dirt from center of road and spread along shoulders over widely varying cycles. It also bladed shoulders . . . sloped banks . . . filled around culverts, removed excess gravel and fine-graded between paving forms . . . spread topsoil on shoulders and backslopes . . . and, with its extremely short turning radius (13'), did a variety of other clean-up, finishing and backfilling jobs where larger units would not have been economical.

"The 'D' is one of the handiest machines ever made for clean-up work," reported the grade supt.

Production work on Garden State Parkway

GEO. M. BREWSTER & SON, Inc., Bogota, New Jersey, enthusiastically praise the 5 high-speed, electric-control D Tournapulls which helped them finish their 1,250,000-yard section of the Garden State Parkway near Atlantic City "well ahead of schedule."

Teamed with a 144 hp pusher on production work, they loaded faster than any other self-propelled scraper — 6 pay yds. of soft wet material (85% sand, 15% clay) in 15 to 30 seconds. They accelerated fast and traveled fast, too. Typical 3000 ft. haul through traffic to build interchange roadbeds averaged 2¼ minutes. Turn off fill, plus 3000 ft. return, also averaged 2¼ minutes — an average, both ways, of 14 mph. Total time on 6000' cycle: 5½ minutes.

Output per unit per 55-minute hour was 60 pay yds. Output per unit per 9-hour day, according to Asst. Job Supt. Lee Cochran was around 500 pay yds. Because of D Tournapull's speed plus low initial cost — half that of many bigger scrapers — lower interest payments, lower taxes, and lower operating cost, all dirt was moved at a very low rate per yard.

D Tournapull capacity struck is 5.9 yds. . . . heaped, 7 yds., without sideboards. Unit has 138 hp . . . weighs about 11 tons empty, 20 tons fully-loaded. Turns in 13' radius, well within its 30' total length.

Supt. likes short turning of "D"

Men on the job report some other important advantages for the D Tournapull, too. Company Supt. William O'Connor says, "We have a very important place for Tournapulls in the construction of modern-day superhighways. They work well whether you have a large volume of fill to be transported from a large pit, or a small amount from the close quarters of a small pit."

Asst. Supt. likes compaction of "D's" tires

Says Assistant Job Supt. Cochran, "Ability of the 'D' to spread thinly and evenly always assures us of meeting compaction specifications. Those big tires do a good job; are just right to give us the necessary 95% compaction on the top two inches of fill. There is no necessity to do any spreading or dozing over and above what Tournapulls do as they unload."

Operater likes comfort, ease of control

Says Operator George Haig, "I like the way the Tournapull people look out for the operator. Those rubber seats to ride on and a cab overhead to give shelter from sun and bad weather are all a part of a very important phrase called 'comfort for the operator'."

Summary

For all-around use, you can't beat the efficiency of the 7-yd. 28 mph D Tournapull.

This rubber-tired, electric-control unit can effectively self-load, push-load, or pair up so two "D's" help each other.

It can handle pioneer dirtmoving before the rest of your equipment moves in.

It can follow production fleets to fine-grade between forms, build access roads, grade driveways, blade shoulders, spread gravel and topsoil.

When it runs out of odd-job service assignments, the D Tournapull fills in well with any combination of push-loaded production equipment.

On weekends, off-hours, or between pressing assignments, it gives you extra profits by doing small hourly-contract work for neighboring farmers and businessmen.

It goes everywhere in a hurry—cross-country, or over pavement. Its 28 mph speed puts 2,000 ft. only a minute away . . . 28 miles only an hour.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-768-H

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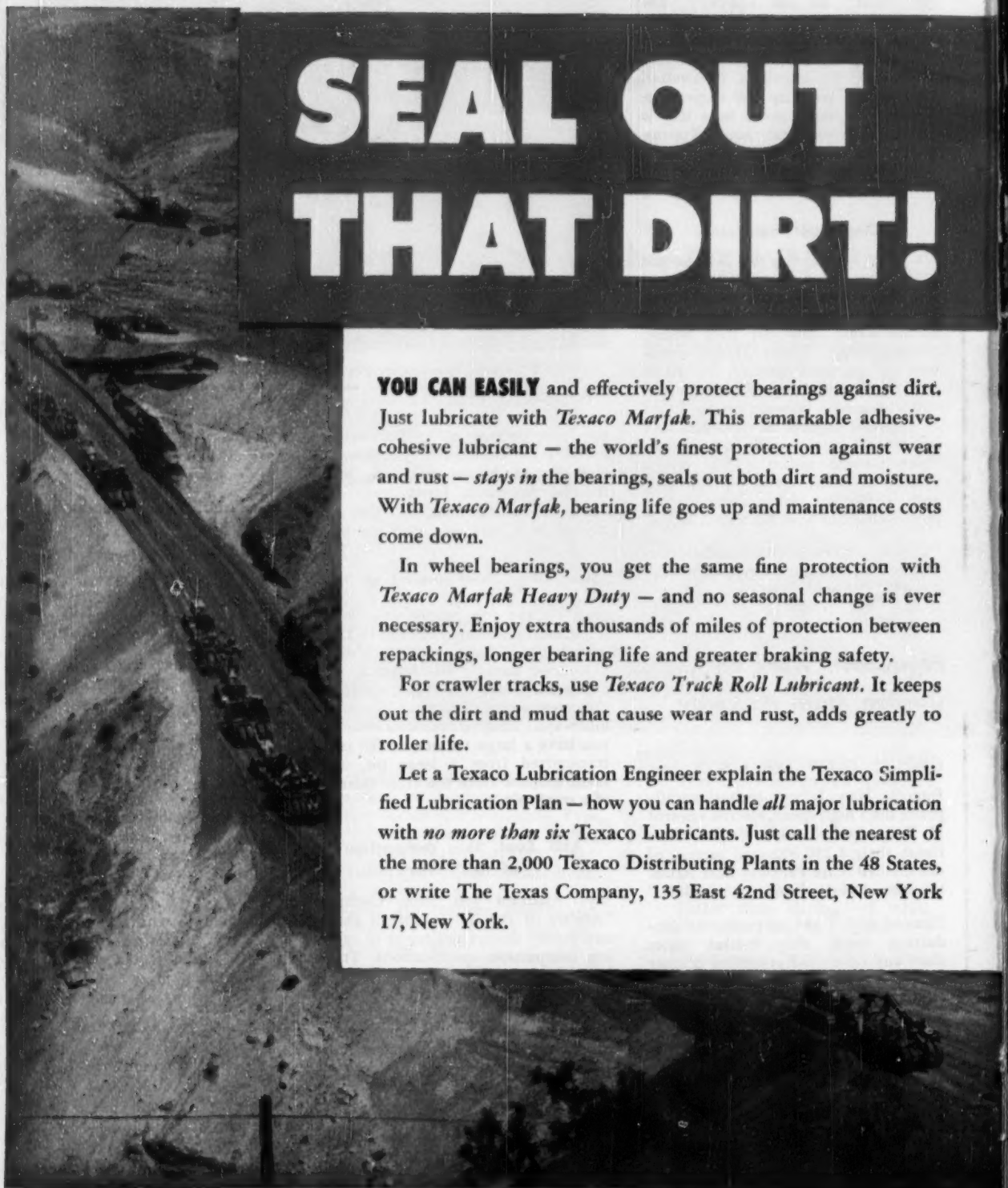

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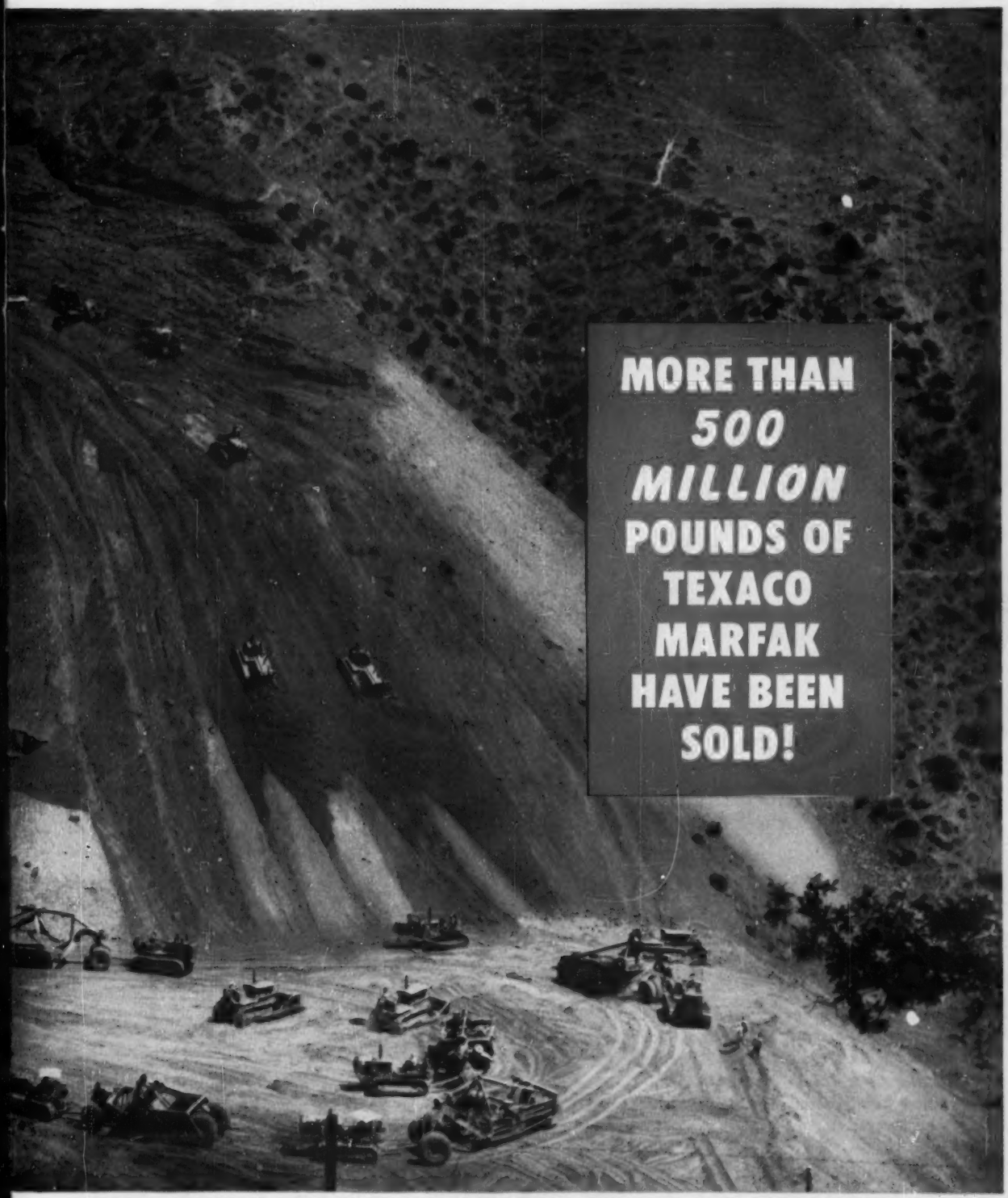

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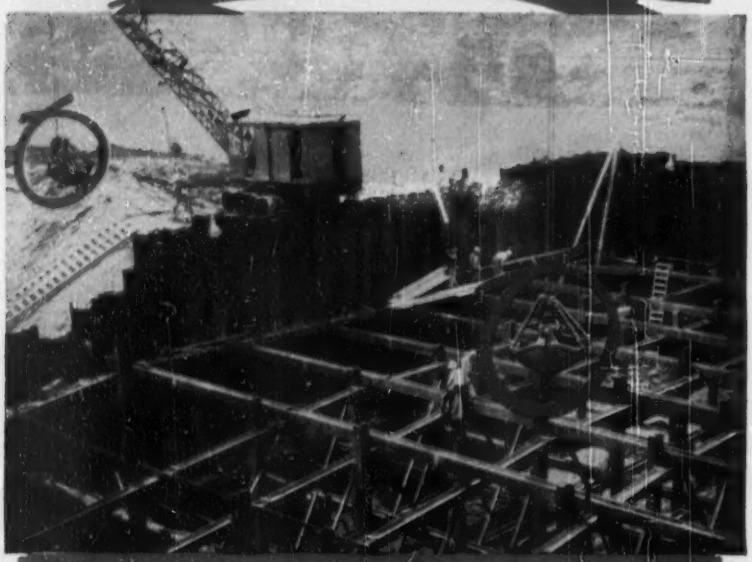

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READER COMMENT

Is ACI Bond Stress High?

SIR: The article in ENR Nov. 11, p. 36, describes the failure of a concrete rigid frame and blames the cause on faulty detailing of the reinforcing bars at the frame corner. In explaining the failure, the article states: "that an area of tension existed at the corners of the precast bents on a plane that was entirely unreinforced." This contention is not borne out by the accompanying sketch showing the reinforcing bars of the frame corner that failed, which does not indicate a single unreinforced plane.

To confuse the issue further, a second sketch is printed of the rebuilt frame. Comparing these two sketches, we can only conclude that the splice of the outer corner bars in the original design was deemed improper, and for this reason, bar splices in the rebuilt frame were moved from the corner to a point 10 ft inside and overlapping of the bars was replaced by welding.

The original design shows a lap of 2 ft, 6 in. as typical for the No. 11 bars. If anyone implies this lap to be at fault, the latest American Concrete Institute Code should be blamed for it, not the designer of this rigid frame. With an allowable bond stress of 300 psi, a lap of 20 diameters is sufficient for a 3,000-psi concrete. For a No. 11 bar, this will be exactly 2 ft, 6 in. as called for in the original design.

It might be argued whether it is good practice to place a splice at the point of maximum moment. Although the ACI Code does not prohibit it, it states that splices at points of maximum stress shall generally be avoided. This, however, is not always possible as was pointed out by J. E. Martin, the designer of the frame, in his comments printed in the Nov. 11th article when he cited as a parallel example the dowel condition at the base of a retaining wall.

In this connection, I might add that an arch tie always has to be spliced at a point of maximum stress, because of the constant stress over the entire length of the tie. Since moving the bar splice from a rigid frame corner somewhere into the span of the bent is more costly and since in other types of construction bar splices at points of maximum stress are unavoidable, a designer can hardly be blamed if he is trying to save his client money.

Where then do we have to place

(*Continued on page 12*)

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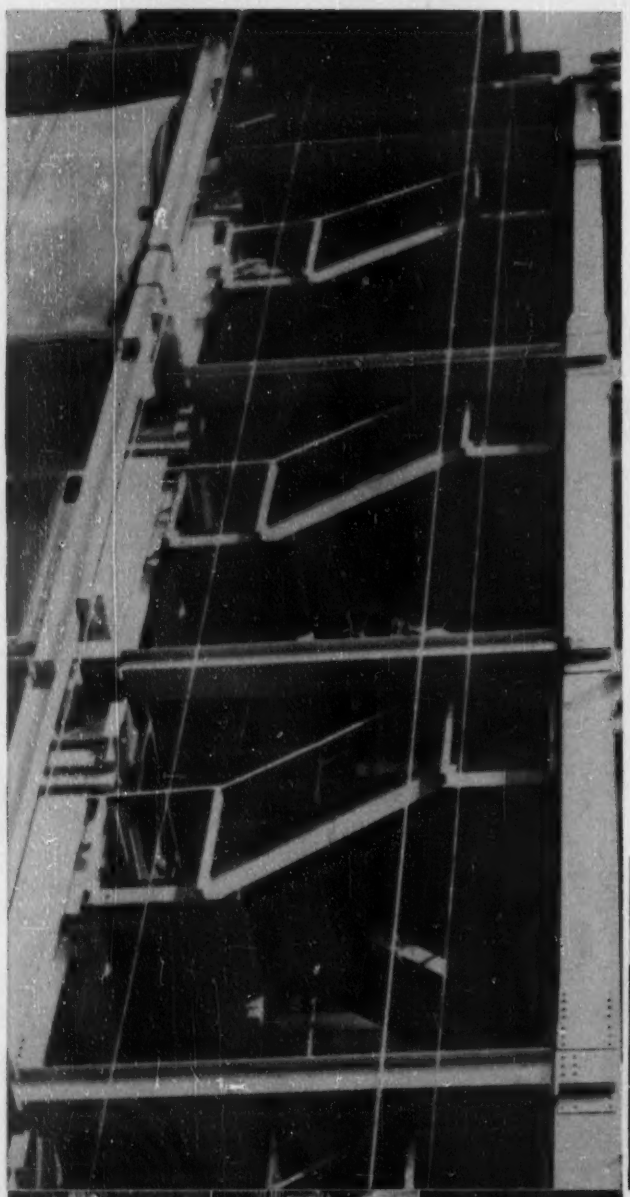

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cut costs with

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Michael Pfaff and his sons Bill and Dick are experts on how to get up in the world economically. They build steel stairs with J&L Junior Channels. In fact during 1953 alone, their company, Standard Metal Products, built 456 floors of stairs—five times the height of the Empire State Building.

One of the big reasons for Standard's success is the way Junior Channels help out in production and shipping costs. Mr. Pfaff reports the company saves about 20 percent in shipping weight on the stairs fabricated with lightweight Junior Channels over an equivalent stair built of ordinary channels. In other words, for each ten floors of stairs two floors are shipped free.

Another advantage pointed out by Mr. Pfaff is that the lightweight J&L Channels can be handled faster and easier during fabrication and finishing. J&L Junior Channel stair stringers are strong, lightweight members. 12 inch sections weigh only 10.6 pounds per lineal foot . . . 10 inch sections 6.5 or 8.4 pounds depending on the web thickness required. A standard structural channel of the same height would weigh almost twice as much. Standard Metal Products Company translates this weight-saving feature into a dollar savings because less weight means less fabricating, erecting and material cost.

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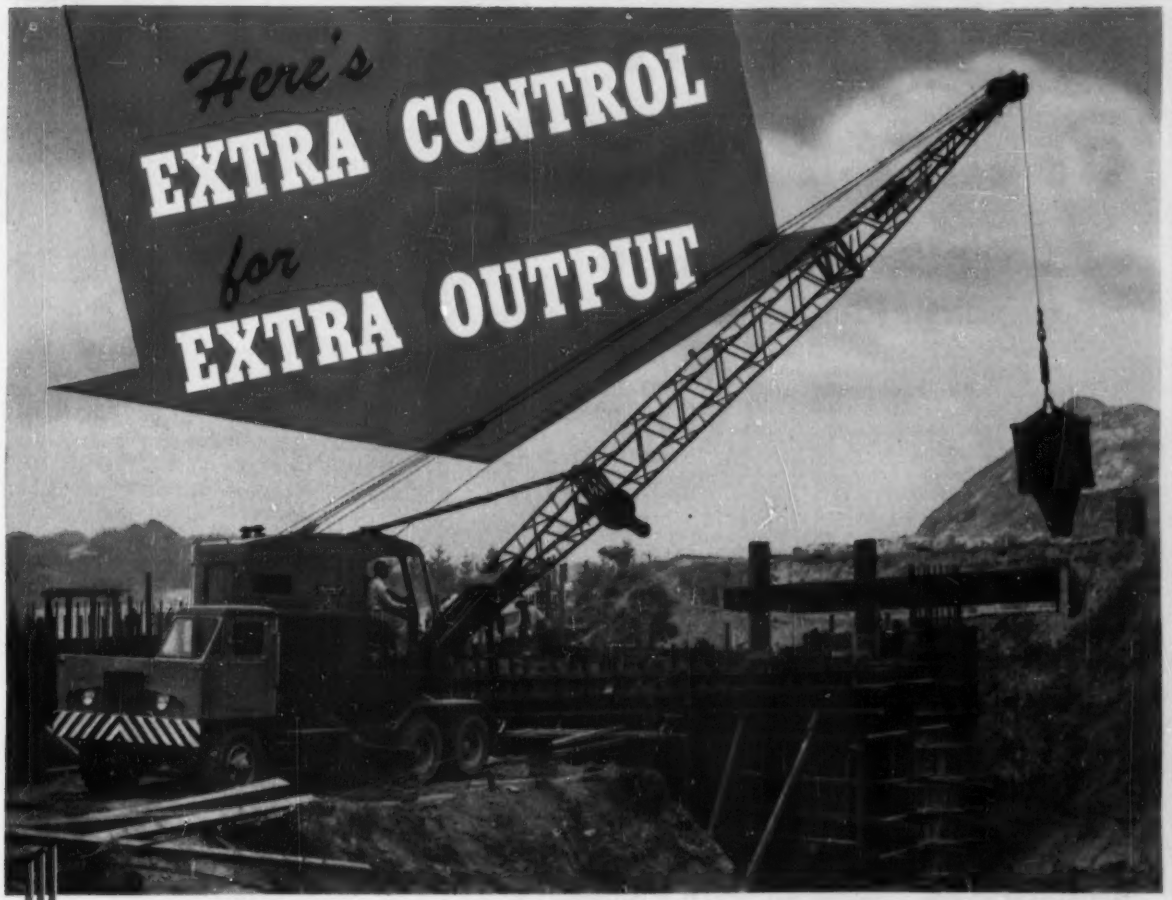

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READER COMMENT

the blame for this failure? Whatever effect one may attribute to the insufficient overlapping splice length, it is hard to believe that too high a bond stress was the sole cause of this accident. After all, there was no live load, and not even the full dead load, on the frame; furthermore, the factor of safety should have taken care of too short an overlap. It would be very interesting, therefore, to know what other contributing factors may have been present.

Pending further information by those who have investigated this accident, which study should be made available to the profession in order to avoid similar happenings, it is the writer's opinion that, if in fact the bond stress was the main cause, the allowable bond stresses in the ACI Code should be revised. These stresses had been increased 100% in 1951. The writer has always felt that this was much too much, especially when used to determine the necessary length of bar laps in splices located in a tension zone.

Before placing the responsibility for this accident on the designer, should we not rather think of revising the ACI Code in the light of the experience gained from this accident?

ALFRED ZWEIG
Professional Engineer
Detroit, Mich.

CALENDAR

American Road Builders' Association, convention, Roosevelt Hotel, New Orleans, Jan. 10-13.

National Constructors Association, annual meeting, Hotel Plaza, New York City, Jan. 11-13.

Highway Research Board, National Research Council Building, Washington, D. C., Jan. 11-14.

National Association of Home Builders, convention, Conrad Hilton Hotel, Chicago, Jan. 16-20.

The American Institute of Consulting Engineers, annual meeting, Engineers Club, New York City, Jan. 17

Annual Concrete Conference, Oklahoma A&M College, Jan. 19-21.

Engineers Joint Council, general assembly, Hotel Statler, New York City, Jan. 21.

Associated Equipment Distributors, annual meeting, Conrad Hilton Hotel, Chicago, Jan. 23-27.

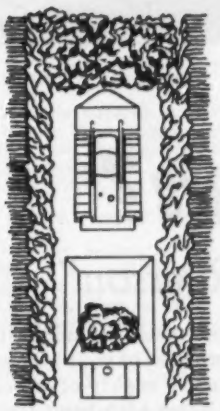
Mason Contractors Association of America, annual convention, Jefferson Hotel, St. Louis, Jan. 30-Feb. 2.

Seventh California Street & Highway Conference, Institute of Transportation and Traffic Engineering, University of California, Berkeley, Calif., Feb. 2-4.

American Society of Civil Engineers, convention, U. S. Grant Hotel, San Diego, Calif., Feb. 8-11.

National Society of Professional Engineers, spring meeting, Hotel Charlotte, Charlotte, N. C., Feb. 18-19.

American Concrete Institute, annual convention, Hotel Schroeder, Mil., Feb. 21-24.



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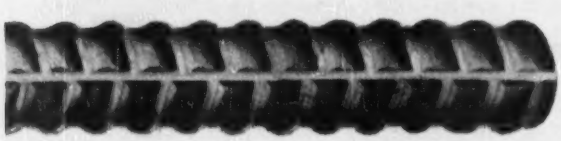

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CONTENTS

NATIONAL AFFAIRS

Chicago Skyway Nears Construction Stage 17
Engineers Seek Cause of California Aqueduct Failure .. 17
Power vs Pikes—N. Y. Power Authority borrows $335 million at less than usual turnpike rate 18
Winter Concrete Work Goes Forward Under Enclosure at Gavins Point Dam 18
Le Tourneau-Westinghouse Buys Old Equipment Firm 18
Chicago Area's Growth Demands New Agency for Water and Sewage Needs 19
Civil Aeronautics Administration Urged to Relax Airport Construction Rules 19
Hurricane Carol's Work Undone by Man 20
New Equipment Stretches the Highway Dollar 21

A GRAND PLAN FOR ROADS ..... starts on 23

The President of the United States has proposed a program that has revolutionized thinking about the highway problem in the United States, that has brought a boldness in planning that is in line with the seriousness of the problem as it affects the nation's growth and welfare. Careful appraisal of the facts behind the proposal brings to ENR's readers answers to four basic questions:

WHY DO WE NEED MORE BILLIONS FOR ROADS? .. 27

Here are the facts and figures of our present highway situation, how the President's proposal would help to improve it.

WHAT KIND OF ROADS MUST WE BUILD? 37

Here are the standards to which existing roads must be brought, new ones built during the next 10 years so that traffic then and for a decade beyond may be adequately served.

HOW CAN WE FINANCE THE ROADS WE NEED? .. 49

Here is an analysis of present highway money sources, of the problems and advantages of revenue bond financing, and an appraisal of our chances to pay for the roads we need without dangerously straining our economy.

IS ROADBUILDING CAPACITY BIG ENOUGH? 65

Results of surveys of materials and equipment, managerial skills, labor and engineers in comparison with the demand that would be generated by an enlarged roadbuilding program.

WHERE THE HIGHWAY DOLLAR GOES NOW

Picture pages 38, 44, 55, 61, 71, 99

ONE ANSWER TO RIGHT-OF-WAY BOTTLENECK .. 97

OTHER DEPARTMENTS

Reader Comment 8
Calendar 12
Obituaries 104
Construction Reports 106
Men and Jobs 131
Activity This Week 134
Editorials 144

THE CONSTRUCTION WEEK

SMOG DISPOSAL SYSTEM?—A $300-million system of concrete-pipe "sewers" to collect smoke and air pollutants, and conduct them for release in nearby mountain areas has been proposed as an answer to Los Angeles' recurrent smog problem.

The proposal is serious enough: It comes from Given Mfg. Co., manufacturers of waste disposal equipment and engineers in electronics and testing and control systems; Louis C. McCabe, chief of the Bureau of Mines Explosives Division and once head of Los Angeles County's Air Pollution Control District, collaborated with Given engineers.

What's proposed immediately is a $2-million engineering study, looking to construction of the system.

SAVE ON PRESTRESS—New Jersey's Garden State Parkway Authority found it would have to pay a little more to build prestressed concrete bridge approaches but would save quite a lot on maintenance.

The job is a 1,700-ft trestle, and piers for truss sections for a bridge over Great Egg Bay. Low bid on prestressed members was $2,298,788—$8,800 higher than the same contractor's (Ole Hansen & Sons, Pleasantville, N. J.) bid for a steel beam alternate. But the authority got bids of $6,000 and $7,000 for field painting of a steel structure.

HELICOPTER HOSPITALS—Hospitals built in the future in Ontario probably will be built with flat roofs to accommodate helicopters serving as emergency ambulances.

Ontario Health Minister Phillips said that economy in construction probably will dictate future hospitals with a central, flat-roofed, four-story core, and single-story wings fanning out from it.

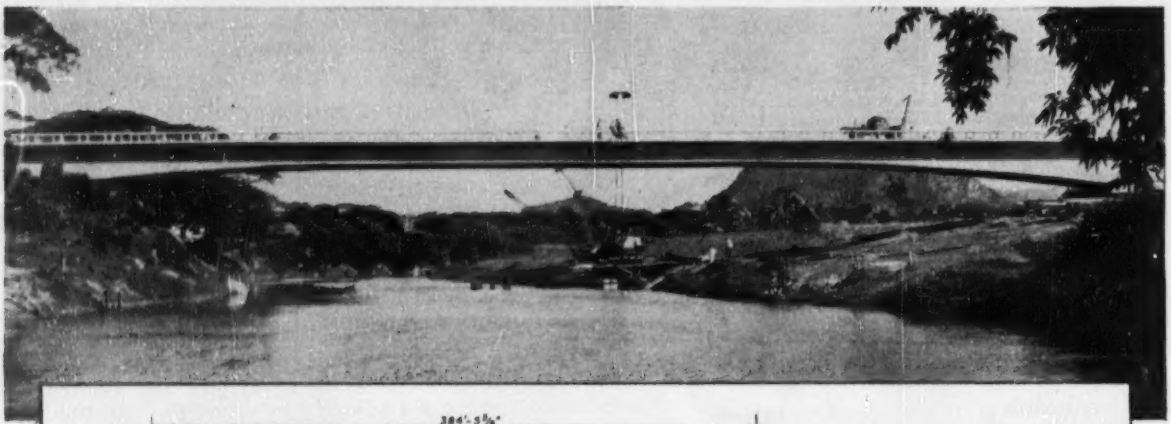
PREVENTIVE MEDICINE—The cause of construction safety may take a step forward next month when compressed-air work begins on the Lincoln Tunnel's third tube at New York.

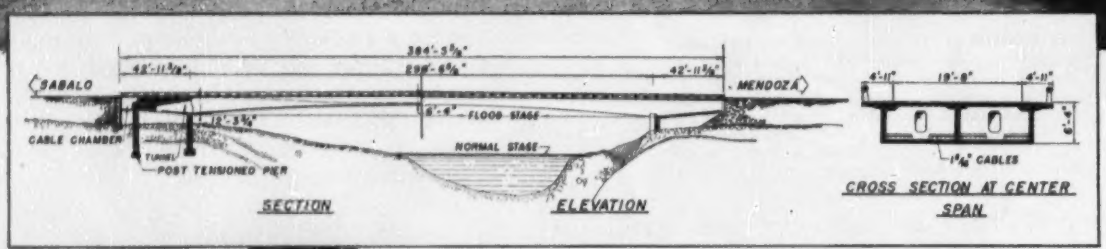
Sandhogs are to be X-rayed to detect bone necrosis, an ailment having high incidence among compressed-air workers. Frequently painless, it can come to light suddenly when the wasted bone breaks under minor stress. On a job, such an accident would become a compensation case. Tunnel owner, the Port of New York Authority, is carrying the workmen's compensation insurance and setting physical-examination standards. The exams are required by New York and New Jersey laws, which, however, don't specify the extent of examination.

Heretofore, routine heart, lungs, hernia, checks—none indictive of bone necrosis—have been made before a man was admitted to air. Unions, normally opposed to "pre-employment" physicals, have gone along. Whether they will accept PNYA's more stringent compliance with the law will bear watching.

Man, What a Span!

Cuba's Cuyaguateje River Bridge Has Post-Tensioned Reinforced Concrete Box Girder with 299-Ft. Clear Span — Longest of Type in Hemisphere





● Engineers in the Republic of Cuba continue to forge ahead with the imaginative use of prestressed concrete bridge design. This span over the treacherous Cuyaguateje River, near Mendoza, is a post-tensioned structure of 299 ft. clear center span, with 43-ft. cantilevers at each end.

Believed to be the longest of its type in the Western Hemisphere, the center span is a two-cell box girder varying in height from 12 ft. 3 in. at the ends to 6 ft. 4 in. at the center. Depth-to-span ratio at center is 1 to 47. Roebling cables 1-11/16 in. and 1-9/16 in. diameter were used for post-tensioning.

Prestressed, long-span construction was dictated by a number of reasons, all sound. Substantial savings in concrete and steel meant low initial cost—competitive with other types of construction. Savings on maintenance are substantial, including elimination of painting, of added importance under tropical conditions. Absence of piers avoids possibility of damage from cresting waters which carry much debris.

Soundness of the prestressed design and its practicability from a construction standpoint are evidenced by this slim, graceful structure which bespeaks quality in every line.

RIO CUYAGUATEJE BRIDGE on Pan American Highway, near Mendoza, Cuba
Designed by
STRUCTURAL SECTION, COMISION DE FOMENTO NACIONAL,
ING. LUIS SAENZ, Chief Engineer
Contractor: **ING. FERNANDO MUNILLA**

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Chicago Skyway

$88-million toll bridge, elevated roadway project nears construction stage

Chicago's $88-million Calumet Skyway toll bridge project is scheduled to go into the preliminary construction stage early in February as a result of bond sales completed last week (see page 18).

De Leuw, Cather & Co., retained by the city as coordinating engineers, will serve as general consultants, coordinating preparation of designs and contract documents. The firm also will direct construction of the project, expected to be in service late in 1957.

The six-lane divided toll project derives its name from two features: It will pass over the Calumet River on a high-level fixed bridge 125 ft above the water, and it will be an elevated structure for most of its 7¾-mi length.

Principal purpose of the Calumet Skyway is to expedite Indiana Toll traffic into and out of downtown Chicago. It will join Indiana's east-west toll road, now abuilding, at the Illinois-Indiana state line at 106th St. and Indianapolis Blvd. Proceeding in a northwesterly direction over the Calumet River, it will terminate in the vicinity of 66th and State St.

Traffic earnings surveys indicate that about 15,000,000 vehicles will use the toll route during its first full year of operation. This number is expected to increase yearly until it reaches a peak of about 27,000,000. Toll charges will range from $0.25 for passenger cars and light trucks, to $0.75 for large trucks.

Construction of the $88-million Calumet Skyway toll bridge project will be under the jurisdiction of Chicago's Department of Public Works, George Demment, Commissioner.

Chamber of Commerce Calls Road Financing Conference

A national conference on highway financing, prompted by the President's proposed $50-billion federal highway program, has been called by the U. S. Chamber of Commerce for Jan. 13 and 14 in Washington, D. C.

Gov. Robert F. Kennon of Louisiana, chairman of the 48-state governors' conference; Gen. F. D. Merrill, Commissioner of the New Hampshire State Highway Department; and Gen. Lucius D. Clay, chairman of the President's advisory committee on a national highway program, will be among the principal speakers.

More than 400 business and government highway specialists will discuss five principal questions:

(1) Should the federal government take over all costs of modernizing the interstate highway system? (2) Should state and local governments be encouraged to finance expanded road programs through borrowing, and if so, how? (3) Should toll road development receive federal coordination through financial aid where needed in the national interest? (4) Should federal automotive excise tax revenues from highway users be devoted to highway financing? (5) From what source should come the major share of additional roadbuilding money?

A good start for '55

Highway engineers given pay raises in Virginia

In a move toward meeting the competition of better paying jobs elsewhere, the Virginia Highway Department has upgraded the salary classifications of its key engineering positions and the starting pay for engineering graduates.

The pay boost, recommended by Griffenhagen & Associates, Chicago consultants in public administration and finance, affects about 130 engineers and becomes effective Jan. 1.

According to J. A. Anderson, State Highway Commissioner, the new schedule will provide salary increases of $50 to $150 per month for the chief engineer and his principal assistants, including eight district and 43 resident engineers. Starting salary for engineering graduates will be boosted from $312 to $328 per month.

These increases, which will total about $40,000 annually, actually represent only the first step in a program recommended by the consultants. To be studied by the state's highway and personnel departments are recommendations for a substantial increase in engineering positions as well as further salary upgrading. The increases under study would amount to over $300,000 annually.

Aqueduct Failure

Engineers seeking cause of circumferential break in steel pipe section

Engineers last week were conducting metallurgical tests to determine whether failure of a steel pipe section in the second barrel of the San Diego (Calif.) aqueduct's San Luis Rey siphon was due to excessive stresses.

The break in the new aqueduct (the San Luis Rey River crossing went into operation Dec. 28, 1953) was discovered almost three weeks ago when a farmer noted water running in the normally dry river bed. Investigation disclosed that a break in the aqueduct had dug a 20x100 ft pit in the river bed and water was geysering 10 ft above the lake which had been formed.

Both barrels of the aqueduct were shut down until plugs could be placed in bifurcation connections with tunnels on each side of the siphon. Twenty-four hours later the aqueduct was placed in service again with only the first barrel in use. The dual line was delivering water at 120 cfs before the failure; the first barrel has been able to maintain a flow of 100 cfs. It was pointed out that fortunately the failure occurred after a heavy rainfall, so that demands on the aqueduct were at a minimum. Repair work was completed this week.

Richard S. Holmgren, chief engineer and general manager of the San Diego County Water Authority, which operates the aqueduct, reported that preliminary investigation after unwatering of the line disclosed a circumferential break about two inches from the welded bell joint of a 48-in. steel pipe section.

The members had parted about a half inch. The section was midway between two heavy concrete anchor blocks 200 ft apart. Holmgren noted it was possible that sufficient tension developed between the anchor blocks, possibly from settling, to cause the break. He said there are 100 similar joints in the San Luis Rey siphon.

The pipe that failed is 13/16 in. steel with a coal tar enamel interior and gunite exterior, designed for 400 lb pressure and plant-tested for 600 lb pressure. It was operating under 400 lb pressure at the time of the failure.

Power vs Pikes

N.Y. Power Authority borrows big sum at less than usual turnpike rate

In spite of the somewhat uncertain state of the bond market and the imminence of the Illinois Turnpike financing, the New York State Power Authority last week borrowed the huge sum of $335 million at a very reasonable rate. Borrowing cost to the authority was 3.19%, a figure that turnpike officials must have eyed wistfully.

About $300 million of the proceeds will go to finance construction. The authority will build half of the $600-million project along the St. Lawrence River. The other half will be financed and built by Hydro-Electric Power Commission of Ontario, Canada.

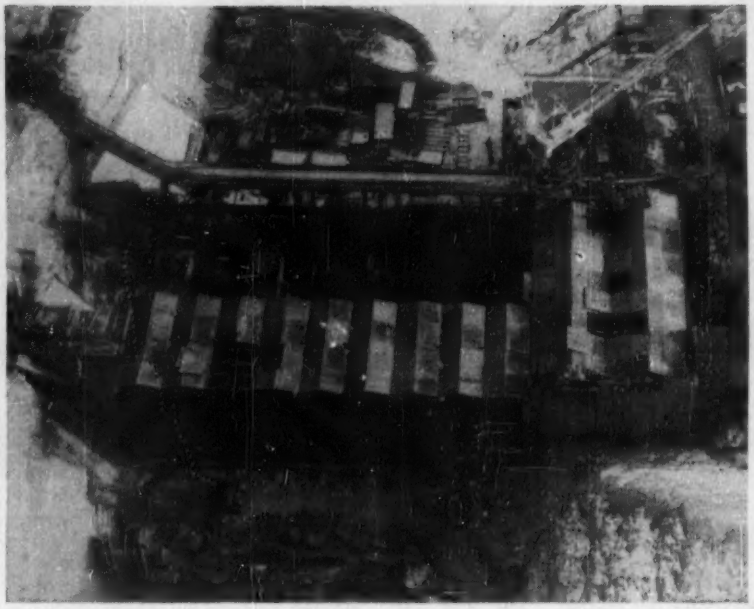
The New York agency's borrowing cost was substantially lower than that which underwriters have charged turnpike commissions. And this is in spite of the fact that at the time it sold its bonds the Power Authority had no sales contracts for any of the power it will generate, and probably will have to seek its market in New York State outside metropolitan New York and Buffalo areas (ENR Dec. 23, p. 47).

By comparison, it cost the City of Chicago 3.44% last week to sell $88 million of 40-year bonds to finance the Calumet Skyway. The Skyway is expected to carry a tremendous volume of traffic about seven miles from the Indiana Turnpike into Chicago.

• **Reasons**—The reasons for the Power Authority's favorable rate are quite plain. Investors are confident that the agency will find a market for its output by 1959, when all its units are scheduled to be in operation.

Engineers' estimates are that the authority can sell its hydro power very cheaply, in comparison with power generated by steam plants, and still provide adequate revenues for interest and amortization. Revenues from sale of power, unlike toll revenues, need not be affected by any national emergency that would require gas rationing.

Furthermore, the bonds of New York State—even though these are revenue bonds issued by an authority—command an especially wide market among investors. The state's credit rating is blue ribbon. Bonds of its agencies are exempt from New York income tax—an important consideration with many investors. And these bonds may be bought by many institutions which are restricted by law in their investments. Finally, the name of Robert Moses, the authority's chairman, has magic in Wall Street.



Winter Concrete Work Goes Forward Under Enclosure at Gavins Point Dam

The biggest enclosure of its kind in the Missouri Basin has been erected at the Army Engineers' Gavins Point Dam near Yanktown, S. D., to permit winter concrete work.

The L-shaped structure, which encloses the intakes and the erection bay of the powerhouse, is 335x70 ft in its principal dimensions. The erection bay L is 125x95 ft. The structure now is 56 ft high but will be successively raised with each lift of concrete until it reaches an ultimate height of 96 ft.

The 35,000 sq ft structure contains 1.9 million cu ft at the 56-ft height. To hold this cubage at a 50-deg temperature against the −32-deg cold spells in the Yankton vicinity has necessitated the installation of two 75 hp and two 100 hp locomotive-type boilers.

The shelter is constructed of panels of 1-in. lumber covered with tarpaper. For strength against horizontal forces, it is tied into the concrete it encloses. The structure successfully has withstood a 55-mi wind.

Steel columns carry the roof. These are sacrificed as the concrete is raised around them, but the gain in winter working time offsets the loss of the steel. Continuous beams the width of the structure rest on top of the columns and carry roof trusses. The roof sections are built so that panels can be lifted off to lower concrete buckets.

The Omaha district office of Army Engineers said two major considerations prompted the Western-Massman & Jones combine to enclose the entire structure instead of covering over a portion at a time, as was done at other Missouri River dams. The big enclosure gives working freedom and flexibility. And, by using the standard size lumber in panels, there will be a high degree of salvage when the work is completed.

The winter work going on is the placing of mass concrete. The Gavins Point powerhouse is an integral part of the dam proper. The concrete will be 50 ft wide. Each of the dam's three intakes being constructed will serve a 33,000 kv generator.

Le Tourneau-Westinghouse Buys Old Equipment Firm

Le Tourneau-Westinghouse Co., Peoria, Ill., has announced an agreement to buy the plants and assets of the J. D. Adams Manufacturing Co., Indianapolis, Ind. If approved by Adams stockholders, the transfer will take place Jan. 1, 1955.

Adams, a pioneer manufacturer of roadbuilding and earthmoving equipment, has been in business since 1885. Le Tourneau-Westinghouse said the Adams plants in Indianapolis and Paris, Ontario, will be operated as the Adams Division of Le Tourneau-Westinghouse. Adams manufactures a line of motograders and traveloaders.

The amount involved in the transaction was not announced, but it was believed to be in excess of $10 million.

Growing Pains

Greater Chicago's growth demands new agency for water and sewage needs

Establishment of a single governmental authority to deal with the complex water supply and sewage disposal problems of Chicago and its farflung suburbs is recommended in a report that will go to the Illinois State Legislature convening next week.

The report proposes that an authority be empowered to acquire existing municipal utilities, but only on a voluntary basis. It recommends that the present sanitary district of Chicago which already serves 75 municipalities be used as a basis for the new setup.

The comprehensive study was made by a special committee on metropolitan water and sanitation, appointed last January by Gov. William G. Stratton. It is headed by Anthony A. Olis, president of the Chicago Sanitary District.

Engineering data, collected by the committee, indicated a need for $480 million of future construction for the proposed metropolitan area. This area, constituting a natural water basin, includes Chicago's Cook County, all of Du Page County to the west, five easterly townships of Kane County and nine northerly townships of Will County.

The committee also stressed the need for rapid development of a port facility including the widening of the Calumet-Sag channel. This project is estimated to cost $120 million.

Some conditions cited by the committee as pointing up the need for a single metropolitan authority are:

- Some communities surrounding Chicago face a shortage of domestic water supplies and some lack enough water to supply potential industries.
- Several communities are without sewage disposal facilities and many others have only minimum systems.
- The entire area is subject to floods as was expensively demonstrated during unusually heavy rains in October (ENR Oct. 21, p. 23).

Chicago can't legally build water mains beyond the city limits. Yet, the Sanitary District Act of 1889 obligates it to supply suburbs outside of city that come within the district. It is prohibited from charging these suburbs any more for this service than it charges Chicago residents. And, over the years some 51 towns and villages, each with its own water supply and set of rates, have used this loophole.

It is self-evident, according to the report, that a regional water authority is necessary to coordinate the diminishing ground-water supplies of the rapidly growing suburbs and to provide Lake Michigan water to areas ready for industrial development.

The report notes that the problem of adequate sewage disposal has been intensified by building booms in unincorporated areas where home owners rely chiefly upon septic tanks for sewage disposal. The concentration of septic tanks in many areas has reached or soon will reach, the saturation point, the report declares.

Texas Turnpike Authority Advances Toll Road Plans

The Texas Turnpike Authority is taking steps to clear the way for a construction start of the state's first toll highway during 1955. The project would extend approximately 35 mi between Dallas and Fort Worth.

The authority has approved the issuance of $58.5 million in revenue bonds and is planning a court test to establish the legality of the issue beyond doubt. It also has approved an engineering report and a trustee agreement with a group of banks.

Howard, Needles, Tamman & Bergendorff, Kansas City consulting engineers, prepared the engineering report. Coverdale & Colpitts, New York, are traffic consultants.

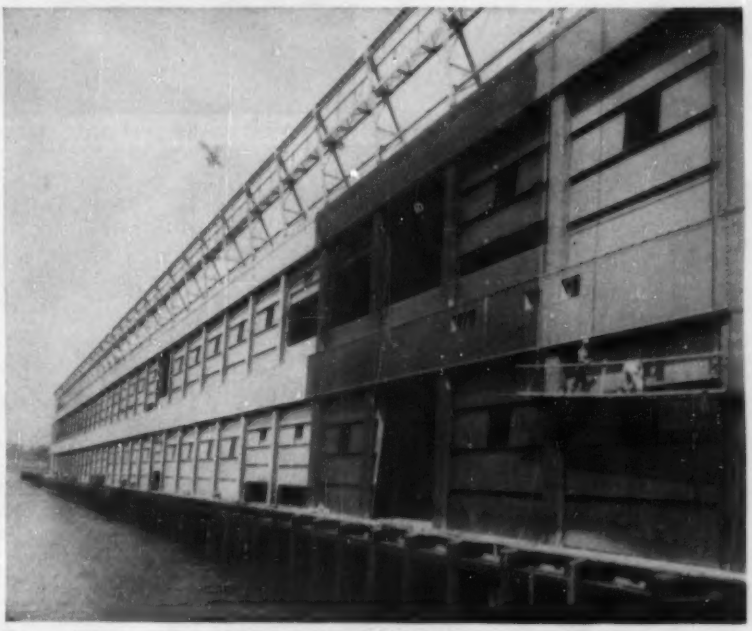
Group Urges CAA to Relax Airport Construction Rules

Managers of the nation's major air terminals last week urged the Civil Aeronautics Administration to overhaul airport and runway construction regulations.

The airport managers, acting through the Airport Operators Council, recommended to Fred B. Lee, administrator of the CAA, a reduction of runway width requirements from the present 200 ft to 150 ft. The council also said the requirement that taxiways be 100 ft wide may be costing airports substantial unnecessary expense.

The council said pilots engaged in bad weather test operations had discovered that lights and other visual aids are more effective on narrow runways. It said also that reducing width requirements for runways and taxiways would make possible "very substantial economies, both in capital requirements and operating costs."

Robert C. Mayer, the council's executive secretary, said airports also could save millions of dollars in construction costs if they were allowed to strengthen the middle portions of runways and at the same time keep the edges fairly thin.

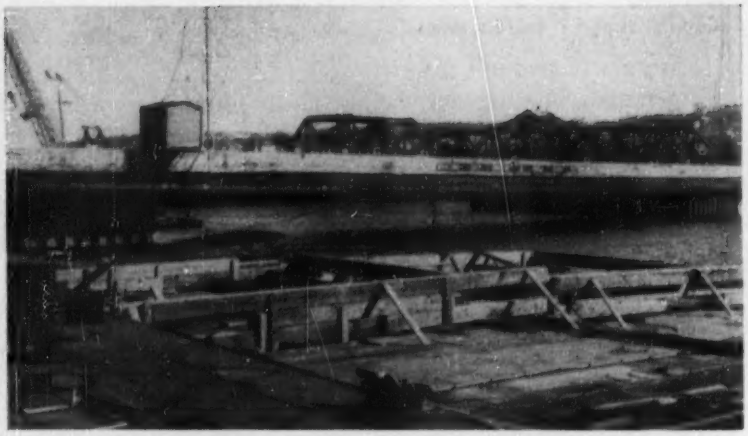


Pier 57 Is Now Open for Business

New York's 720-ft-long floating concrete-box pier was formally opened this week. The concrete substructure of Pier 57 on the Hudson River will take advantage of buoyancy to support 90% of the total dead load. The deck is supported on prestressed concrete stringers (ENR Aug. 14, 1952, p. 33), while the superstructure is of structural steel construction. A total of 126 vertical sliding doors, of a new type fabricated by the International Steel Co., Evansville, Ind., line the sides of the pier. Each of the manually operated, 20x18-ft doors consists of four counterweighted 600-lb leaves, which slide upward to stack compactly over the opening.

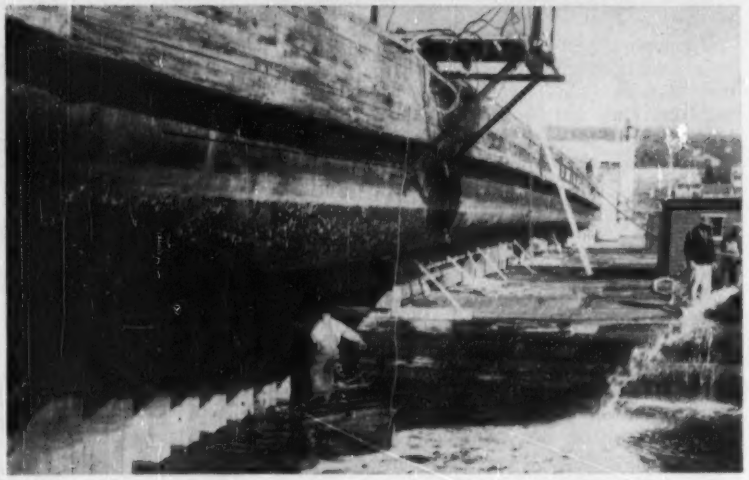
The Lady's Work...

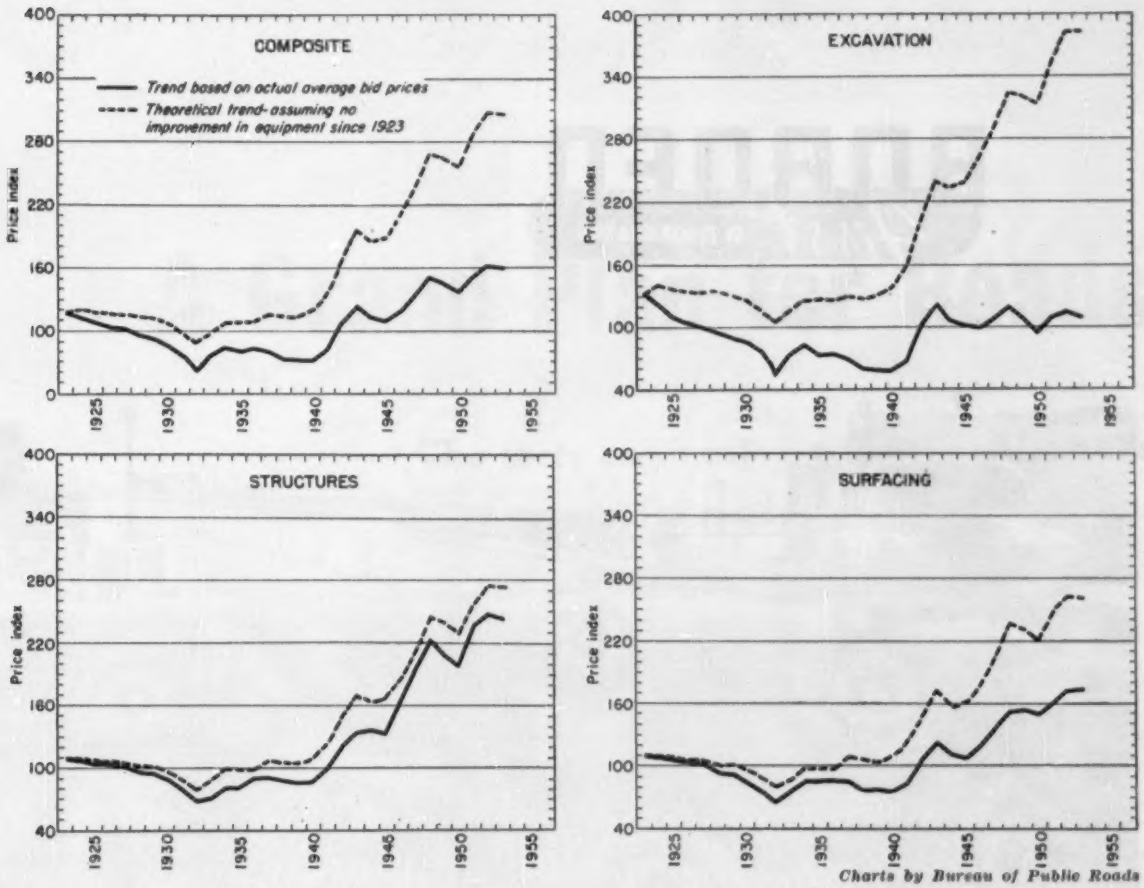
Hurricane Carol teamed with an abnormal tide to lift a 1,000-ton steel barge atop two cofferdams of the new bridge over the Sakonnet River between Tiverton and Portsmouth, Rhode Island. The 327-ft barge had been in use as part of a causeway for servicing substructure work on the bridge by Whaling City Dredge & Dock Corp. of Groton, Conn., holder of the $1.5 million substructure contract.



... Undone by Man

The contractor successfully removed the barge from its perch by flotation. Five wood barges, partially filled with water, were slipped under the steel barge at low tide. Water was pumped out of the wood barges as the tide began to come in, and two tugs pulled the barges free. The wood barges were again filled with water and snapped out from under the steel barge, which then went back to work (below) on the nearly completed substructure job.





ROADBUILDING COSTS today are far less than they might have been because . . .

New Equipment Stretches the Highway Dollar

Higher equipment output achieved during the last 30 years on highway construction will "save" more than $90 billion in carrying out President Eisenhower's $100-billion ten-year roadbuilding program.

That statement sounds surprising until you look at the four accompanying charts. What it means is this: building the $100 billion of new roads would cost more than $190 billion if contractors and their workers still used the same machinery and methods that they employed in 1923.

To show what mechanization and higher productivity have saved in highway construction dollars, the Bureau of Public Roads recently prepared the four revealing charts. By two plotted lines, the charts compare: (1) the actual trend of construction bid prices over the years and (2) what the work would have cost if better machines and better methods had not supplanted the construction practices of 1923.

Specifically, the analysts—in computing the figures for the upper curves—started with the distribution of actual construction costs in 1923 as recorded in BPR data. The distribution falls into three main categories: (1) labor, (2) materials, and (3) equipment, overhead and profit.

Basic cost distribution for these items in 1923, compared with 1953 is shown in the following table:

DISTRIBUTION OF HIGHWAY CONSTRUCTION COSTS

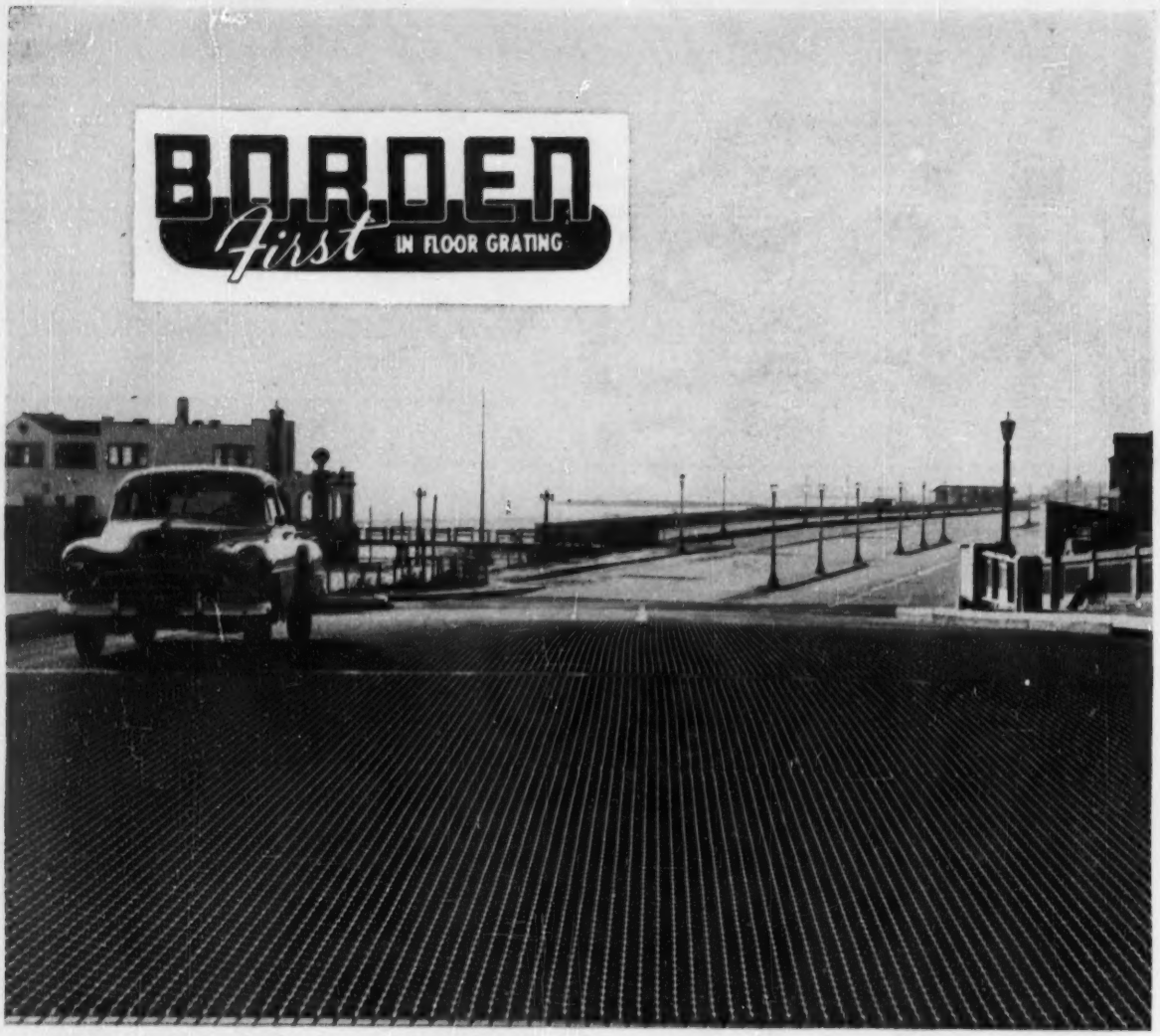
	Excavation (Percent)		Surfacing (Percent)		Structures (Percent)		Composite (Percent)	
	1923	1953	1923	1953	1923	1953	1923	1953
Labor	45	32	20	20	25	30	30.0	26.4
Materials	5	12	65	50	50	40	42.4	36.8
Equipment, Overhead and Profit	50	56	15	30	15	30	27.6	36.8
Total	100	100	100	100	100	100	100.0	100.0

In figuring labor costs for the upper curve, the average wage per man-hour for each year was first established.

As these reported figures give only totals for each contract, there is no way to make adjustments for changes in the relative proportions of common labor and skilled craftsmen. There is a bigger proportion of high-wage skilled workers on road construction today than 30 years ago. BPR says this change—in addition to the actual increase in wages for individual crafts—has had considerable effect in pushing up the computed average wage rate and the resultant computed labor cost that goes into the figuring for the upper curves.

BPR's significant study was directed by M. B. Christensen, assistant deputy commissioner in the division of engineering. The figures were put together and charted by his able aides, H. D. Fish, Edwin J. Coppage and Edwin L. Stern.

Christensen puts the story in a nutshell: "Past accomplishments are the result of increasing the productivity of the labor-equipment combination. The great strides that have been made in improvements in construction equipment and in application of mechanized methods to highway construction are responsible."



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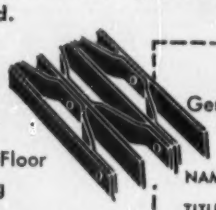

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An Engineering News-Record Report

A Grand Plan for Roads

The facts behind President Eisenhower's proposals for a new multi-billion dollar program of highway investment

The words "grand plan" are those of the President. And they are hopefully prophetic, for in the six months since he used them in a message to the Conference of Governors a revolution has occurred in highway thinking. For the first time there is a boldness in planning being applied to the nation's highway problem that is commensurate with the seriousness of the threat that inadequate highways pose for the nation's growth and welfare.

The President must be credited with giving this thinking its focus. He gave the problem accurate dimension by his statement that "experts say $5 billion a year for 10 years, in addition to current normal expenditures, will pay off in economic growth." He admitted an over-riding federal responsibility for financing the interstate system. He acknowledged the usefulness of tolls. And he appointed an advisory committee of knowledgeable business men under the chairmanship of General Lucius D. Clay to give such practical substance to these new ideas that Congress would make the grand plan a reality.

Although this Clay Committee is now finished with its studies it is too early to say what of its recommendations the President will accept for transmission to Congress. But it is not too early to seek understanding of the problem and knowledge of the facts that must be faced.

It is the purpose of this report to enlarge that understanding and to marshal these facts. A total-need program will require a $100 billion expenditure over the next 10 years, $50 billion more than we are now scheduled to spend. A program that would add to present plans only the area of greatest need—that of the interstate system with a few primary additions—would approximate $75 billion. Whichever of these programs is chosen— and the smaller can only be the forerunner of the larger—the answers to the following four questions are controlling:

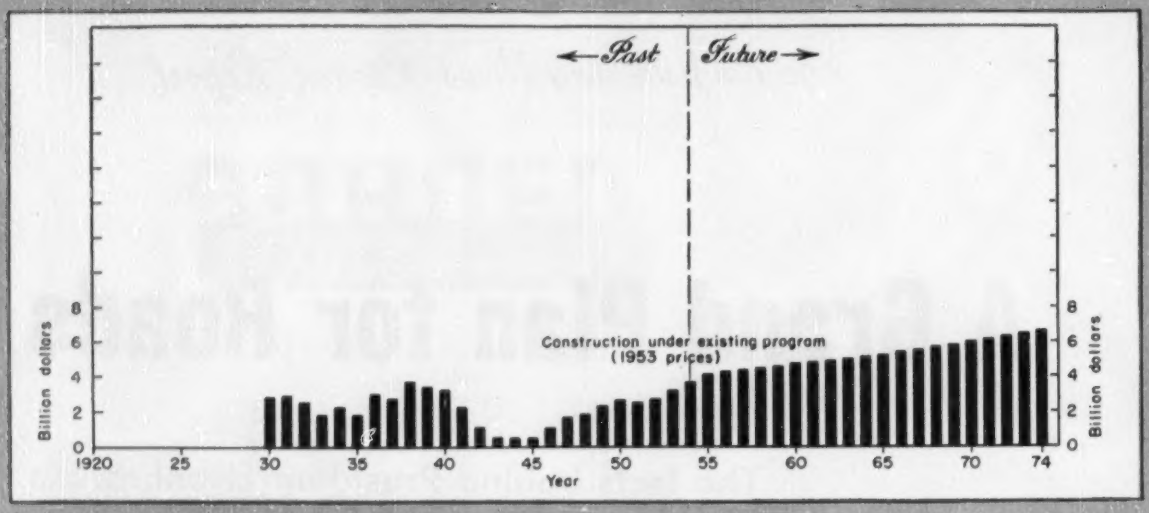
1. Why do we need extra billions for roads?

2. What kind of roads must we build?

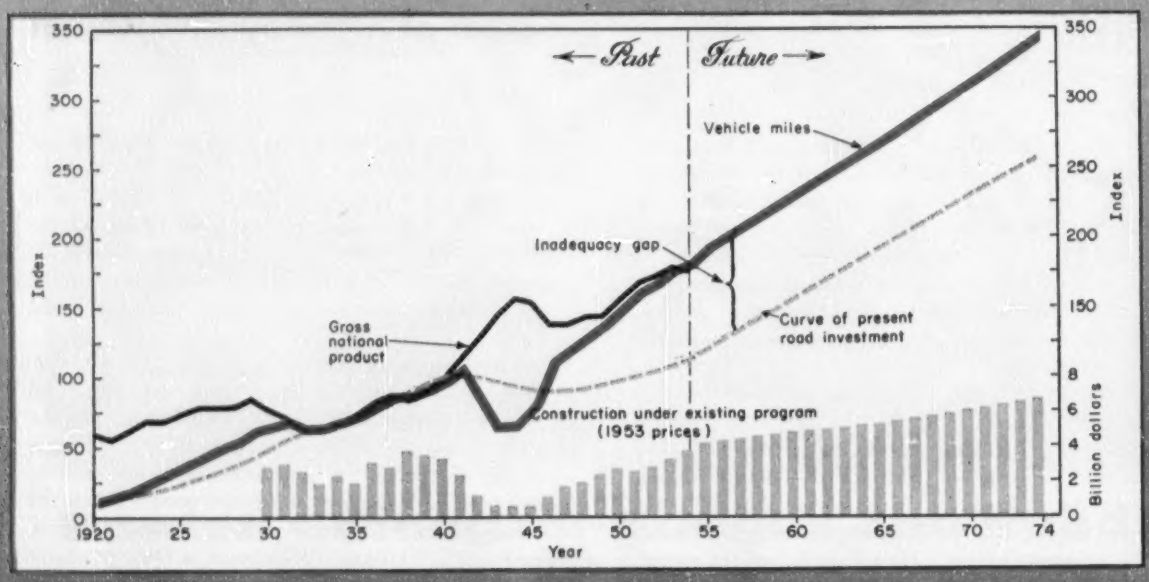
3. How can we finance the roads we need?

4. Is our roadbuilding capacity adequate?

For the answers, turn the page



WHY: (1) With roadbuilding only inching up at this rate . . .



(3) . . . and thus can never catch up with traffic in our growing economy . . .

Double Our Annual Investment

The special message which President Eisenhower will deliver to Congress next month on the nation's highway needs and how to meet them may well rank with the great Presidential pronouncements of all time.

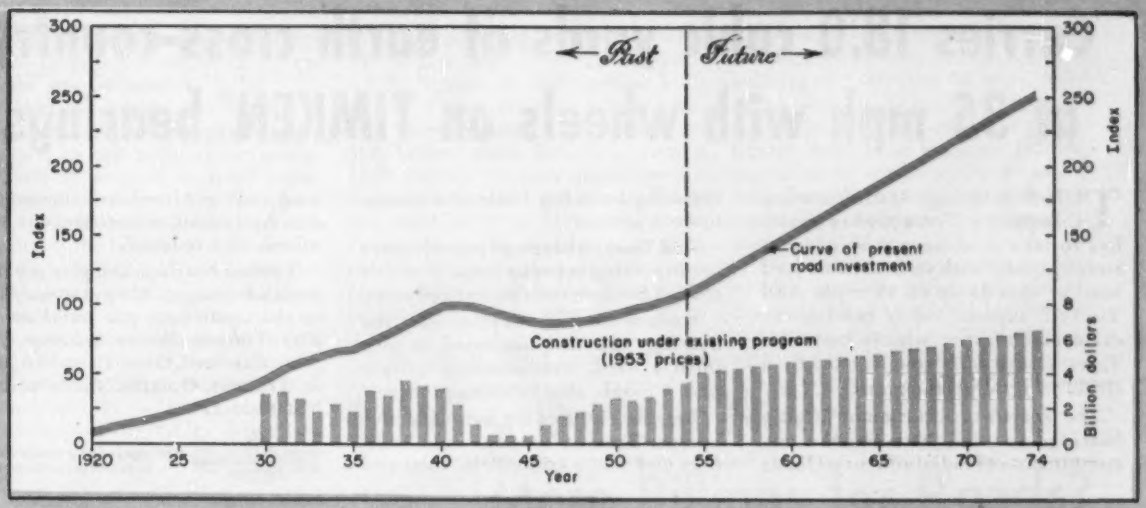
Focused on a problem second only to national defense, and concerned with a mobilization of effort and funds in magnitudes heretofore associated only with war, the message will also be significant in another respect:

It will be a call to inject a growth stimulus into an already healthy peacetime economy and not—as most great Presidential pronouncements of the past have been—spurred by an economic emergency or a threat of war.

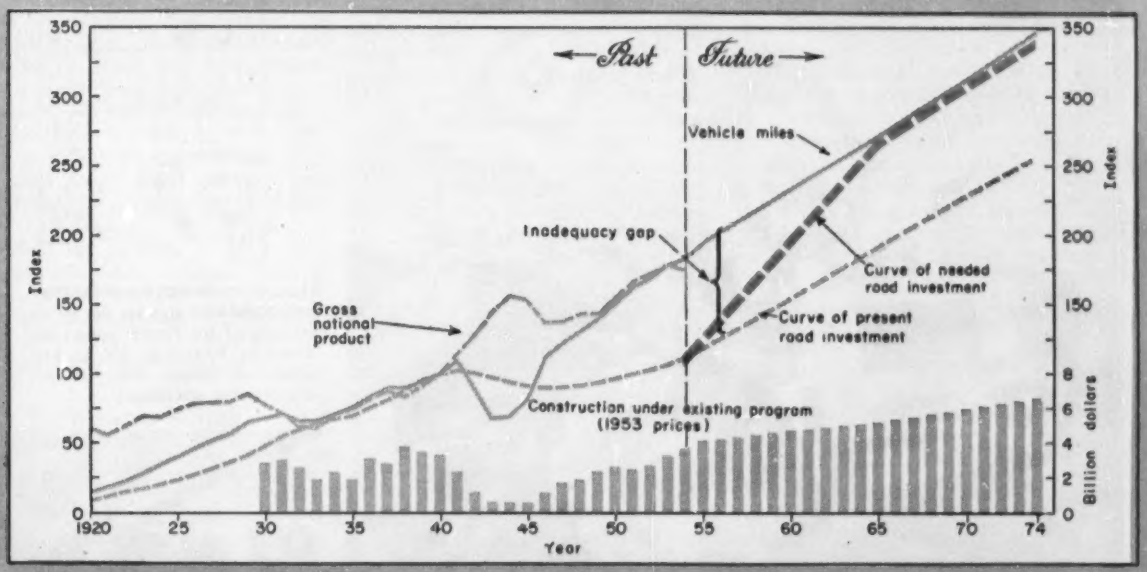
It is partly this economic twist that gives the message its particular importance. But basically, of course, it is the bold program of roadbuilding that will be recommended that can make the President's statement historic. For the program is so broad in scope and so huge in size that no inhabitant of the nation can be left unbenefited, and no element of the economy can remain untouched.

If appraisal in such strong terms seems excessive, consider these facts:

(1) Over the past decade, all levels of government have invested a total of $23 billion in highway improvements. The President, if he accepts in total the conclusions from the latest survey of road needs, would have to urge that the comparable figure for the



(2)...our total investment in highways can only increase at this rate...



(4)... but the inadequacy gap can be closed in 10 years if we...

in Roadbuilding

next decade be $100 billion. Even if his definite recommendation involves a lesser figure—and $75 billion is the minimum expected—it would represent three times the past decade's investment in roads.

(2) During the present year all levels of government spent $3.729 billion on road construction—the greatest such sum in highway history. Yet a $75 billion 10-year program would raise this annual expenditure to $6.8 billion initially by the injection of new financing methods, and to nearly $8 billion later as traffic growth produces additional tax revenue. Annually we would be doing about double what we are doing now. And if a $100 billion "total need" program were undertaken the yearly accomplishment would rise to nearly three times.

(3) Or consider the effect on people:

They have increased both their ownership of motor vehicles and the miles they drive them annually about 100% over the past 15 years. In contrast, the annual expenditures to improve the roads they drive on have not increased at all in terms of what 1939 dollars would buy now. And for five of these years—during the war—improvements were almost totally suspended.

Correcting the resulting road inadequacies through such an enlarged program as is envisioned would permit our people to save some large part of the $3.5 billion estimated to be lost yearly because of accidents and traffic delays, besides making motoring more pleasant. Equally important, it would cut the cost of business transportation

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The tapered construction of Timken bearings enables them to take any combination of radial and thrust loads resulting from big loads and rough, uneven ground.

And Timken bearings provide extra load-carrying capacity because of line contact between their rollers and races.

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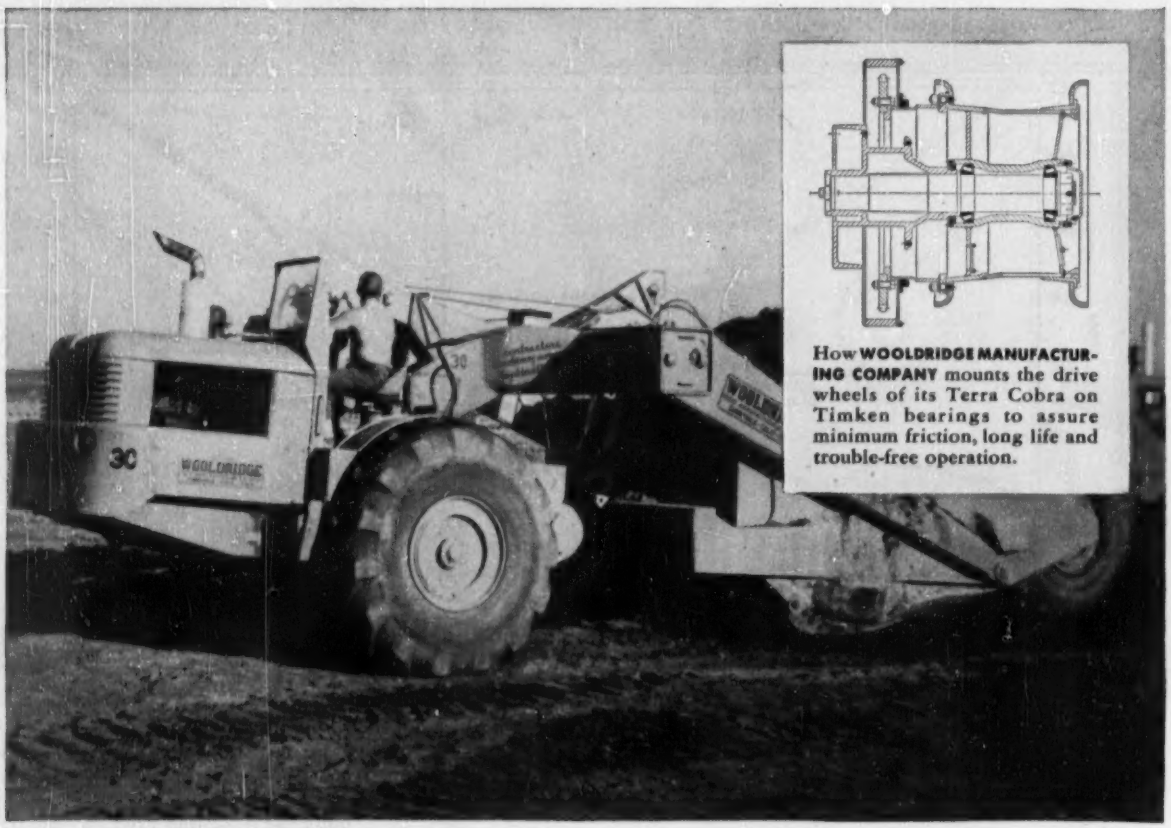
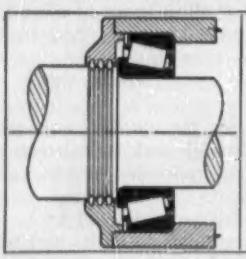


How **WOOLDRIDGE MANUFACTURING COMPANY** mounts the drive wheels of its Terra Cobra on Timken bearings to assure minimum friction, long life and trouble-free operation.



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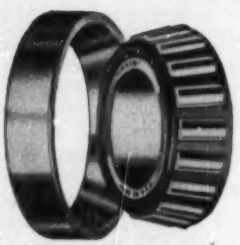

NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION

and foster the trend toward greater industrial decentralization, with its social and defense benefits.

(4) Finally, beyond the benefit to business from adequate highway transportation, an enlarged and continuous roadbuilding program in itself would generate employment in every region of the country and stimulate industry right across the board.

A $75 billion 10-year program would require spending $2.5 billion a year more on construction than our existing program will provide, and a $100 billion program would require $5 billion more. What each additional billion would do in detail is shown in an accompanying table, based on experience with past roadbuilding programs.

There are, of course, many other ways to suggest the massive nature of such a program—how its 10-year total is about the same as the total contracts for weapons, airplanes and industrial facilities let by the Defense Department since the Korean war; how is would dwarf the "great" public works program of the depression years; or how just the extra expenditures it would require over the next ten years would build two or three dozen St. Lawrence projects, Empire State Buildings by the hundreds or homes by the millions.

And yet such comparisons are largely capricious, since they are unrelated to the huge roadbuilding need. More informative is the fact that the program is for the benefit of a country of 160 million people who traveled 557 billion miles this year in motor vehicles conservatively valued at $120 billion. Fitted into such a framework, with travel estimated to increase to 814 billion miles by 1965, even a $100 billion investment to permit these vehicles to operate efficiently and effectively is far from out of scale. Nevertheless, the investment is large enough that both its justification and practicability need to be fully established before funds are committed to it.

This special report aims to answer the basic questions raised by a proposal to spend many extra billions for roadbuilding over the next 10 years. Why do we need to? What would the extra billions buy? Where would we get the funds? And, if the financing problem can be solved, is such a program within our physical capacity—of engineers, contractors, equipment and materials supply and labor skills?

Affirmative and convincing answers to such questions will provide the nation with proof of a good investment, and give Congress the data it needs to vote intelligently on the proposal.

How Each Extra Billion For Roads Would Be Spent

	Millions of dollars
Right-of-way and engineering	$200.0
Materials and Supplies	
Sand, gravel, crushed rock	56.0
Cement	33.6
Ready-mix concrete	19.2
Asphalt, tar, road oils	28.0
Pre-mixed bituminous	17.6
Concrete culvert pipe	12.1
Metal culvert pipe	8.4
Structural steel	42.0
Reinforcing steel	22.0
Lumber	9.6
Timber piling	1.6
Explosives	3.2
Clay pipe	.8
Fuel and lubricants	28.4
Other materials	15.9
Total materials and supplies	299.0
Contractors' on-site labor	217.0
Contractors' equip. expense	147.0
Contractors' misc, overhead and profit	137.0
Total	$1,000

1. Why Do We Need More Billions for Roads?

Broadly speaking, doubts have ceased to exist that our roads are inadequate and require major improvement. It could hardly be otherwise in the face of the alarming buildup of traffic congestion and highway accidents. Moreover, reams of authenticated statistics are available to prove the point. We had 31 million motor vehicles at the end of the war. Today, 10 years later, we have 58 million. Projecting the same rate of growth—if road capacity permits—there will be over 80 million in 1965.

Miles traveled each year by these vehicles increased at an even faster rate over the same period—from nearly 250 billion in 1945 to nearly 600 billion today.

• **The big gap**—So the highway load has increased well over 100% in a decade. But investment in highway improvements—i.e. roadbuilding—over the same length of time has lagged far behind any comparable growth.

Back in the Thirties, as shown in the chart at the head of this article, vehicle miles, road expenditures and gross national product advanced at about the same rate. The war caused a natural dip in both miles traveled and road building while GNP soared. By 1949, however, vehicle miles were again in step with gross national product, but roadbuilding had been left far behind—and with no chance of catching up without some special push.

As the chart shows, roadbuilding expenditures, even under the presently existing program, will grow substantially in the years ahead—from $3.7 billion this year to $6.3 billion in 1974—thanks to increased federal aid from the 1954 Highway Act and from increasing tax revenues as more vehicles travel more miles. But new construction money will not grow as fast as the vehicle miles, and thus the present big gap between the two—the degree of road inadequacy—will steadily widen.

The imperative need now is to bridge this inadequacy gap—to catch up on roadbuilding—so that construction thereafter may be correlated directly with traffic growth and the growth of the economy.

Before putting a price tag on this gap-closing operation, it would be well to take a look at what our road system comprises today, how it is administered and how it is used. Then the inadequacies and the costs of eliminating them can be compared with the funds that present financing methods will produce. What these funds won't cover is the measure of our needs.

• **The roads we have**—The public road mileage in the United States totals about 3,350,000, to which must be added close to 2,500 miles of new toll roads. Rural roads account for slightly less than 3 million miles of the total, and there are 350,000 miles of city streets.

This vast network of highways is divided into three main systems according to governmental jurisdiction, but these are regrouped and divided in ways that may sometimes be confusing unless the theory and purpose are understood.

Thus, the three main systems are state, city and local, the latter including county, town (in New England) and township roads. State roads, in turn, are divided into primary and secondary systems in each state. No special divisions occur in the city and local road systems, but over the past two decades considerable mileages from both these systems have been absorbed into the state systems.

It is when the word "federal" is

applied to road systems that confusion sometimes arises.

Actually, there is no federal system of roads in the United States, only the roads in the national parks and forests (less than 85,000 miles, much of which is trails) being under direct federal jurisdiction. What we do have is a "Federal-Aid" system, meaning a designated network of state, city and local roads, which is partly financed by the federal government, and built and maintained to standards approved by it, but administered by the state highway departments.

This federal aid network, totaling 673,137 miles, is by far the most important element in our road system, and it includes roads of every type—state, city and local.

It, too, is divided into a primary and a secondary system, another cause for confusion because of the primary and secondary systems in each state.

In truth, roads from both the state primary and secondary systems are on the federal-aid primary system, while other state primary and secondary roads are on the federal-aid secondary system. City streets and local roads also appear in both federal-aid systems. And to make comprehension more difficult, the federal-aid primary system has a rural and urban division, on both of which all kinds of roads appear.

The best way to understand the classification of U.S. roads is to refer to the accompanying table, "Our Highway Systems and Their Mileages" which is arranged in a form that has not previously appeared in print. Except for 1954 totals of federal-aid roads, it shows the mileages as they existed Jan. 1, 1953, because later detailed figures are lacking.

Our Highway "Systems" and Their Mileages

	Jan. 1, 1953 data	June 3, 1954 data
Rural Federal-Aid Primary System		
On State Primary System	209,103	
On State Secondary System, County and Town Roads	2,221	
Subtotal	211,324	218,594
Urban Federal-Aid Primary System		
On State Primary System	14,889	
On State Secondary System, County and Town Roads	1,387	
Subtotal	16,276	16,510
Total Federal-Aid Primary System	**227,600**	**235,104**
Federal-Aid Secondary System		
On State Primary System	142,453	
On State Secondary System	75,453	
On County and Town Roads	214,674	
On City Streets, Parks	3,574	
Total Federal-Aid Secondary System	**436,154**	**438,033**
Total Federal-Aid, Primary and Secondary	**663,754**	**673,137**
Mileage Not on Federal-Aid Systems		
On State Primary System	36,704	
On State Secondary System	148,318	
On County, Town and Township Roads	2,119,528	
On City Streets	289,951	
Miscellaneous (park and forest roads and toll roads)	84,915	
Total Not on Federal System	**2,679,416**	**2,679,416**
Grand Total, Federal and Non-Federal	**3,343,170**[1]	**3,359,553**

[1] Includes 712 miles of toll roads, mostly under Miscellaneous as shown, except for those few cases where states regard toll roads as part of their primary non-federal-aid systems. At the present time, an additional 753 miles of toll roads are in use, 920 miles are under construction, and 3,800 miles are under study.

• **Origin of the systems**—This breakdown of road mileage into categories and systems developed in response to growing traffic, with the states first providing aid to the counties, and then creating state systems out of some of their county roads. This early process was speeded in 1916 when Congress first voted federal aid to the states—requiring the creation of a state highway department as a prerequisite. It was promoted further in 1921 when the state highway departments were required to designate a system of main highways (originally 7% of their rural mileage) on which federal aid would be granted.

Thus a more or less connected nation-wide system of state highways came into being. By the 1930's most of the mileage had been surfaced, eliminating the mud menace with which the system originally had been plagued. But before the end of the '30's, traffic had grown so much that many of the old surfaces were in need of rebuilding—and the roads of being made wider, less curvy and less steep. Before this program could be well started, however, World War II came, creating unprecedented heavy hauling and at the same time causing postponement of improvements.

The growing traffic load built up pressure for highway improvements and for more federal aid. And in 1944 Congress broadened the federal-aid program by adding a federal-aid system of secondary highways, to supplement the primary system with feeder roads from villages and farms to the main highways. It also provided that certain urban highways could be incorporated into both the federal-aid primary and secondary systems. And it raised the main trunkline routes of the federal aid primary network to the special status of an interstate system, contemplated as super main highways and limited to 40,000 miles of routes connecting all the major cities and production centers. The importance accorded this system was emphasized by providing an additional $25 million of federal aid for it, to be added to the amounts it would get from normal federal aid funds.

Over the years the amount of federal aid provided the states on a 50-50 matching basis has steadily increased—from $5 million a year in 1917 to $125 million in 1931. It jumped to $200 in 1938, slid away to nothing during the war, but was resumed in 1946 at $500 million. In 1954 federal aid was upped to $575 million, and it is scheduled to go to $875 million in 1956. Of this last named sum, $175 million is earmarked for the interstate system—and on a different federal-state matching basis of 60-40.

And that is where we are today, progressively recognizing the growing needs for additional road improvements through increased federal aid on the one hand and greater state expenditures on the other. Yet judged by traffic congestion, by the mounting bill for maintenance and by continuing high accident totals, we are always spending too little, too late.

• **Inadequacies are known**—Fortunately, we know in detail and with considerable exactness what the inadequacies are and (within the limits of good estimating procedures) what it will cost to remedy them.

The state highway departments and the U.S. Bureau of Public Roads first began to find out shortly after the war

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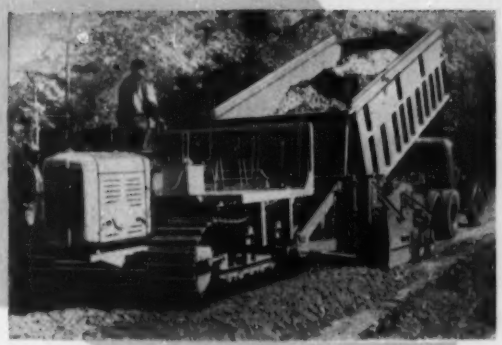

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by instituting various types of studies—in effect a progressive inventory taking. The result is rather precise knowledge of what each state needs, mile by mile and bridge by bridge, to bring its facilities up to designated standards.

It is worth understanding, in broad outline at least, how these so-called sufficiency studies are made, since 27 states have used at least some variation of them.

In the first place, they seek to place an adequacy rating on each section of road and on each bridge. Then with the needs established it is possible to estimate the cost of correcting the inadequacies. Structural condition, service capacity and safety are examined, and for a fully adequate facility the ratings given each of these elements add up to 100 points. In the BPR rating plan, par for structural condition is 40 points; for the other two 30 points each.

Under the BPR plan, which is more or less representative of state and county plans as well, structural condition takes into account subgrade (8 points), drainage (7), subbase and base (15) and wearing course (10).

Service capacity measures the ability of the facility to carry traffic without unreasonable congestion, and without restriction of overall operating speed to unreasonably low levels. Evaluation is based on horizontal curvature, passing opportunity, surface width and rideability.

Safety reflects the highway characteristics that affect the individual driver: width of lanes, shoulders and bridges, consistency of alignment (whether there are unexpected changes in curvature) and inadequate sight distances for safe stopping.

With a sufficiency rating established for an element of a highway, an estimate can be made of the cost of bringing it up to standard.

Based on the results of these surveys, the American Association of State Highway Officials in 1953 compiled a state-by-state record of the miles needing improvement, and the estimated costs of improvements for the entire 673,137 miles of the federal-aid system—primary, secondary and urban. Each of these classifications of roads was found to be deficient to some degree in approximately two-thirds of its mileage, and the cost of rectifying the deficiencies was placed at just under $35 billion.

• Price tag outdated—But while the inventory of inadequacies remains a reasonably accurate measure of the physical needs, the $35 billion figure is both incomplete and outdated as a measure of costs. We are now talking about roughly $100 billion. Why?

In the first place, the $35 billion covered only today's needs on the federal-aid system; the larger figure applies to all roads. Moreover, the $35 billion figure was artificial to the extent that it related to the cost of rectifying the deficiencies instantaneously as of the date of the estimate—an obvious impossibility. Were the deficiencies to be removed over a period of 15 years, during which continuing obsolescence would also be rectified, the AASHO estimated back in 1948 that $52.5 billion would be required—spending being at the rate of $3.5 billion a year.

Thus it is the $52.5 billion that must be related to the $100 billion figure—$101.365 billion, to use the exact total obtained in the latest estimate of total needs. (see table).

But since $32.653 billion of this is for roads and streets outside the federal-aid system, the truly comparable figure becomes $68.712 billion for federal aid roads. It is of this larger dimension for several reasons: (1) the new proposed deficiency-correcting program is for 10 instead of 15 years' duration; (2) much higher standards are assumed for the 40,000 mile interstate system than were originally contemplated—more four-lane and six-lane divided pavement, all or nearly all on wide limited-access right-of-way with no grade crossings and much more mileage relocated; and (3) the traffic load at which two-lane routes on the primary system would be increased to the four-lane divided type is lowered.

Another important cost-raising factor in the new estimates for correcting present road deficiencies in 10 years is the requirement that the facilities then provided be adequate for 10 years more.

Of the $68.712 billion estimated need for federal-aid roads, $23.914 billion is for the interstate system, $29.922 billion for the remainder of the federal-aid primary system, and $14.876 billion for the federal-aid secondary system as shown in the accompanying table.

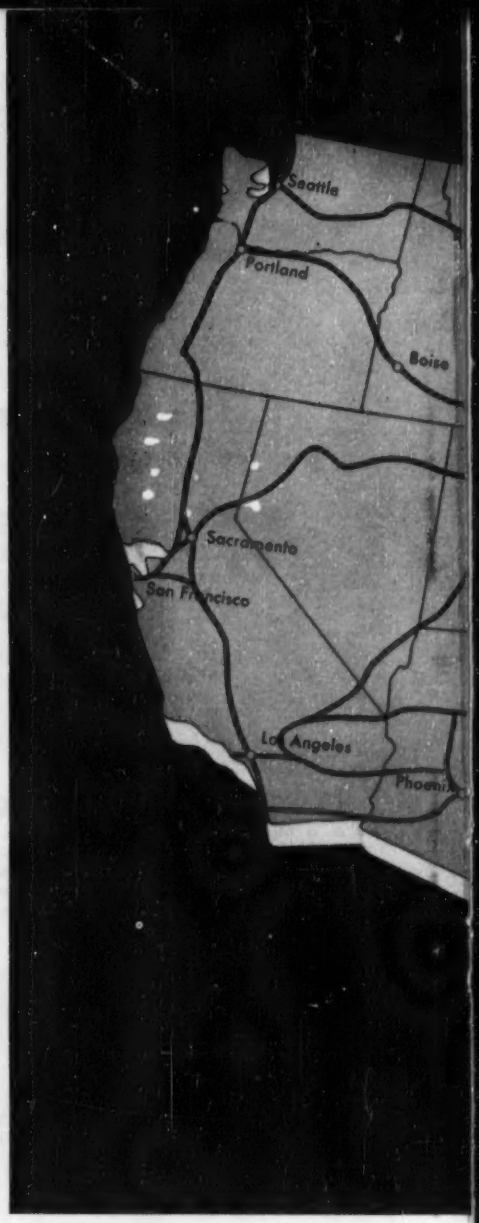
• The goal to work for—The new look at highway needs, which produced the $101.365 billion figure, was a result of a Congressional requirement in the 1954 Federal Aid Highway Act, which directed the Bureau of Public Roads to make a study "of the costs of completing the several systems of highway in the several states."

The BPR enlisted the aid of the AASHO to update the cost estimates in its earlier survey in accordance with new standards believed to be fitted to the real needs of the nation. As a consequence, the survey of needs not only reflects the roadbuilding costs over the next 10 years, but also looks farther ahead and charts the kinds of costs that must be faced after the initial decade if the adequate roads we build are to remain adequate. The goal to work for was set down for three main classifications of roads as follows:

1) For the interstate system, all mileage which is not now adequate for 1974 traffic, or which by 1964 will become inadequate for 1974 traffic, should be rebuilt by 1964.

And it would be rebuilt so that at the end of 1964 all mileage in service would be structurally adequate, would meet geometric design standards for 1974 traffic conditions (indeed would have a geometric life expectancy of 30 to 40 years from the date it was completed), and would have a sufficient number of lanes of high type pavement to handle traffic to 1974.

Moreover, right-of-way would be



This is the 40,000 mile Interstate System on which the President is expected to propose federal spending of $25 billion over 10 years to convert it into a great national superhighway net serving business and the national defense.

secured or reserved by 1964 for all sections which would require additional lanes by 1984—in no case reserving less than for ultimate four-lane development.

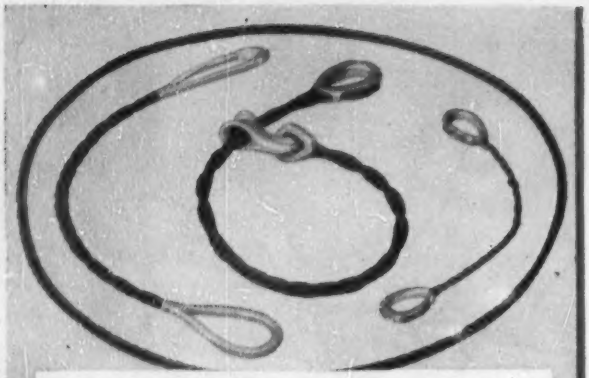
The program envisions that toll roads meeting the standards, as well as free roads, would be incorporated into the interstate system. Completion of such a 10-year construction program would then permit the succeeding 20-year period to 1984 to be devoted to rebuilding worn-out surfaces and constructing new lanes.

2) Likewise, for the other federal-aid primary roads now critically deficient or becoming so in the next 10 years, rebuilding by 1964 is contemplated to standards that would provide a sufficient number of lanes for 10 years after completion, on a road with high-type pavement for the most part, and with a geometric section adequate for 30 years. Right-of-way would be reserved or secured by 1964 for all sections which would require additional lanes by 1974.

In the succeeding 20-year period after 1964, mileage of this federal-aid primary system not in the first 10-year program would be rebuilt as it became critically deficient. Operations in that period would also include adding lanes where required, rebuilding worn-out surfaces, purchasing previously reserved right-of-way and reserving or securing additional right-of-way for construction needed after 1974.

3) Finally, for the roads of all of the other systems, a definite though less far reaching program of improvement is contemplated. All heavily traveled mileage now deficient or becoming so by 1964 would be rebuilt with sufficient lanes for 10 years, have a "suitable" surface and by geometrically adequate for 20 to 30 years. Right-of-way would be secured or reserved by 1964 for all sections estimated to need additional lanes by 1974.

A rural road is assumed to become "heavily traveled" when traffic reaches 400 ADT (average daily traffic), while for mileage in cities the dividing point can range up to 5,000 ADT, depend-



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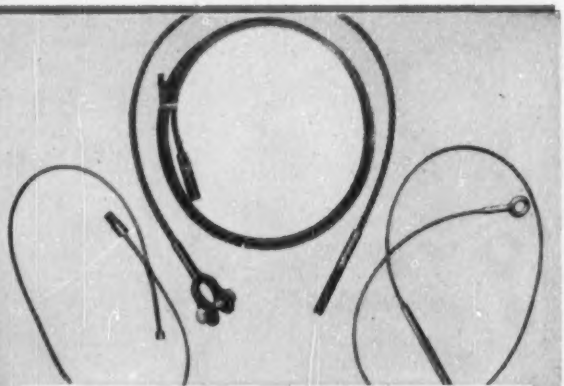

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ing on the size of the city. "Critically deficient" means a road does not measure up to some tolerable standard, which, of course, may vary depending upon type of road, terrain, etc.

Broadly, interstate system roads are deficient if they are not adequate for 1974 traffic, and primary system roads if they are not adequate for 1964 traffic. For other roads a tolerable standard has to be set more loosely—in some cases merely being passable is tolerable.

• **The need defined**—Unless some such goal as this is set and then sought to bring our highway systems up to tolerable standards, dire consequences can be seen for our increasing living standards and our growing economy.

Take the condition of the roads with respect to the traffic load:

According to the Bureau of Public Roads, we have barely built our road investment back to what it was prior to the war (about $40 billion at its properly depreciated value), while use and demand have gone far ahead. Thus in 1941 the depreciated highway investment per car in use stood at $1,064. It had dropped to $691 by 1953. This is one measure of highway need—less road per car.

A corollary to this same measure of need is furnished by the total number of motor vehicles in use, estimated at 58,129,000 and representing an 87% increase since the war. Considering the fact that there are from 5 to 7 million new vehicles registrations each year—and allowing for those which are merely replacements for old cars retired from service—there is a probable net increase in total vehicles of 2 million each year. Again assuming that road capacity permits it, there would be 80 million vehicles by 1965 and nearly 100 million by 1975.

Even to raise our depreciated highway investment per vehicle to what it was prior to the war, say $1,000, the total would have to approximate $75 billion in 1965. Obviously the actual investment would need to be considerably larger (to produce a $75 billion depreciated value in 10 years) and then we would only have a road system capable of rendering a service comparable to that available prewar. Such service is patently not good enough to support a rising standard of living.

With this reasoning, the road-per-car measure of road needs can be given something of a monetary dimension. It is by no means definite, but a 10-year expenditure of upwards of $100 billion is not to be ruled out.

The accident toll offers another way to appreciate the need for better highways.

Since 1945 the annual number of traffic deaths has risen from 28,076 to 38,300. This is a tragic figure even though it reflects an improvement on the basis of miles traveled (7.1 deaths per 100 million miles in 1953 as against 11.3 in 1945), or on the basis of vehicles in service (7.0 per 10,000 as against 9.2 in 1945). On the basis of deaths per 100,000 population, on the other hand—and this may be the most important measure—there was an increase from 21.2 deaths in 1945 to 24.2 in 1953.

In the final analysis, of course, each of these measures of highway needs is only a reflection of the broader aspect of the situation—the necessity to assure a highway transportation service adequate to our growing economy and the requirements of our national defense. For it is important to note that three-quarters of the nation's annual freight tonnage is moved by trucks, which also account for 15% of the ton-miles chalked up, despite dominance of railroads in long-haul business.

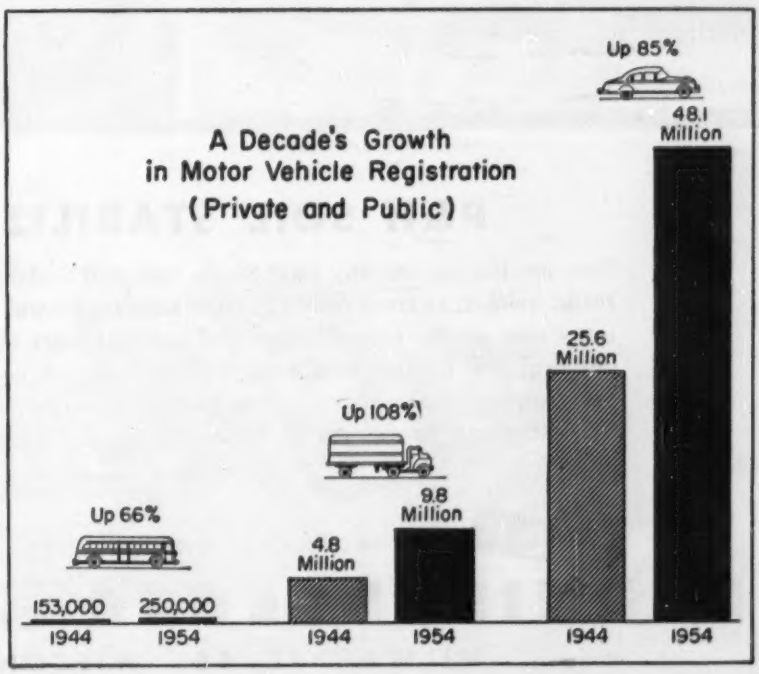
Equally important is the fact that 700,000 individual businesses are said to be directly connected with highway transport, including, of course, those that make up the vitally important automobile, petroleum and rubber industries, and all those that cater to the huge tourist trade. In total, it has

(*Continued on page 37*)

Total Road Construction Needs, 1955–64, By System and Amount

(Millions of dollars)

Interstate-rural	$13,052	$23,914	$53,836	$68,712
Interstate-urban	10,862			
Other federal-aid primary-rural	19,887	29,922		
Other federal-aid primary-urban	10,035			
Federal-aid secondary	14,876		14,876	
Other rural roads	17,073	32,653		
Other city streets	15,580			
Grand total—All roads and streets				$101,365



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ING COSTS IN '55

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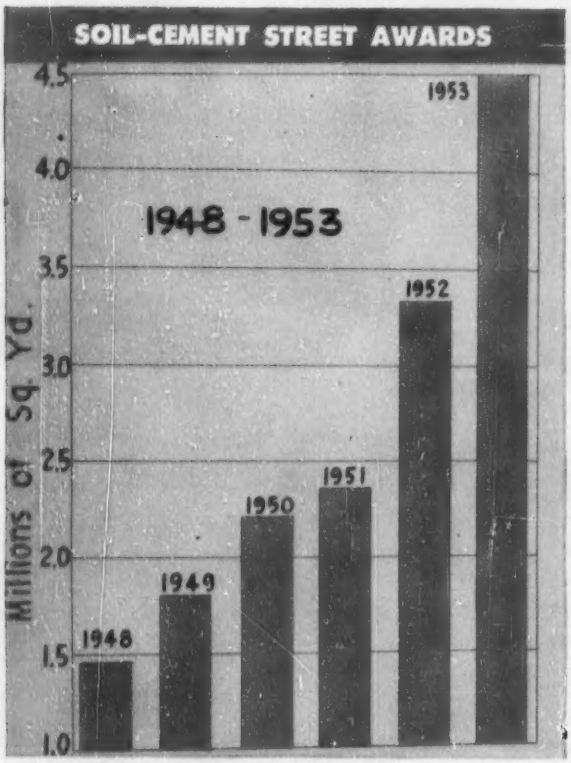

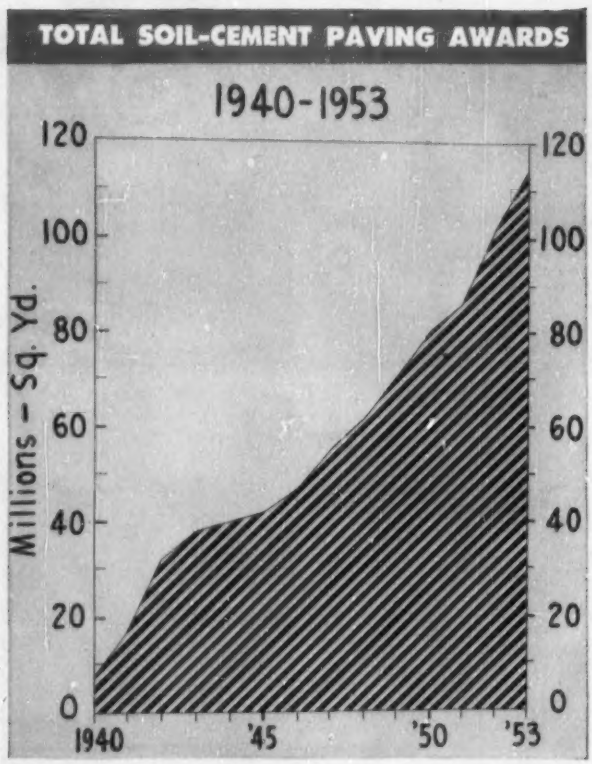

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been estimated that one-sixth of the nation's labor force gets its jobs as a result of highway transportation.

Nor do highways merely serve the economy. They also contribute powerfully to it by requiring in their construction and maintenance vast quantities of the products of the asphalt, cement, steel, quarrying and construction equipment industries. And the payments made to workmen, engineers, architects and contractors make a substantial contribution to the national income.

With highway service so closely allied to the growth and health of the national economy, highway traffic and the gross national product should rise at about the same rate in a growing economy. And, except during the war period, such a relationship has existed. But growth in highway traffic should just as logically be accompanied by comparable growth in highway facilities. And this has not happened. Traffic rose rapidly with gross national product, but growth in highway facilities lagged, until today there is a wide gap to be bridged.

It is this gap that most graphically and clearly defines our highway needs. By some means and in some reasonable period of time it must be closed to bring our highway facilities into consonance with the demands of traffic and economic growth.

This was the conclusion on which President Eisenhower predicated his "grand plan." And in choosing a 10-year period to accomplish it, the price tag added up to $101.365 billion. Following our present plan of road investment would produce less than half that amount ($46.8 billion), and at the end of ten years we would still be as far behind as we are today. So as accurately as estimates can show, $54.565 billion defines the road needs that the nation must make special plans to meet during the next ten years.

And once such a program is completed, annual roadbuilding needs could be met by a lower level of expenditure. The BPR, for example, estimates that for the 20-year period following the completion of the $100 billion program, a total expenditure of about $140 billion would be adequate, or $7 billion a year. We need, therefore, to spend $10 billion a year now so that we can have adequate roads for $7 billion a year later.

2. What Kind of Roads Must We Build?

If we were to spend the necessary extra billions on roadbuilding over the next ten years, the new highway facilities upon completion would be adequate for at least ten years in the future. And they would be planned for the improvements that the traffic growth of an additional ten years would require.

That at least is the goal fixed by the experts in the Bureau of Public Roads who carried out the road-adequacy studies directed by Congress in the 1954 Highway Act. It is also the objective upon which the President focused his road program.

What kind of roads are these? The answer to this question can be given with considerable exactness since definite specifications had to be used in order to make the cost estimates that produced the $101 billion total-needs figure. Obviously, too, different specifications were required for the different classifications of roads—the highest type applying to the interstate system, the next highest to the primary federal-aid system, with a third specification applicable to all other roads.

• **Geared to traffic loads**—Justification for radically differing specifications rests on the traffic to be served, which falls off sharply as the lower classifications of roads are reached. Estimates show that the federal-aid rural roads, which account for only 18% of the total road and street mileage of the country, carry 42% of all traffic, while another 39% is carried by arterial city streets whose mileage is 1% of total.

Not only does this 19% of all road mileage, i.e. about 670,000 miles, carry 81% of all traffic, but 40% of it is carried on 100,000 miles and largely on the 40,000-mile interstate system.

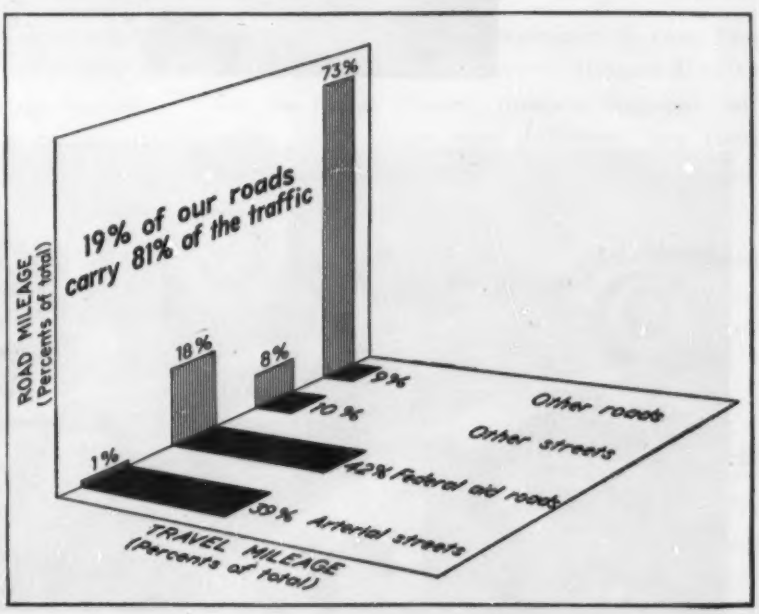
In recognition of these relative traffic loads, the division of the $101 billion is preponderantly and properly in favor of the interstate routes and the primary roads of the federal-aid net, which require $24 billion and $30 billion respectively to meet the specifications, or an average per mile of $600,000 and $155,000. The remaining $47 billion goes to all other roads, totaling about 3 million miles.

Specifications set for the interstate system are somewhat higher than those adopted by the AASHO in 1945, while those for the remainder of the federal primary system are in general accord with the AASHO recommendations of that date. So, taking the specifications as a guide, here are the kinds of roads upon which the program is predicated.

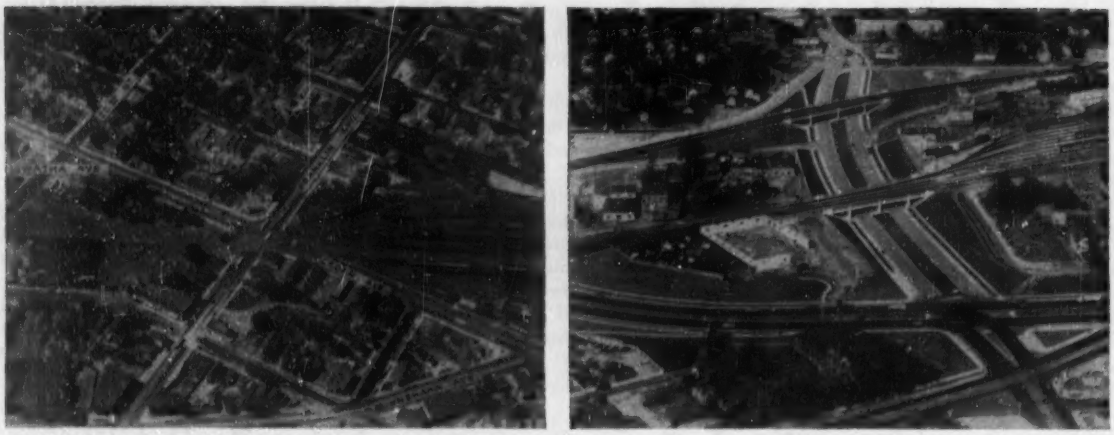
• **Interstate roads**—On this all-important 40,000-mile system of superhighways passenger cars would be able to travel safely, even during times of high traffic volume, at speeds of approximately 50 mph in rural areas, and from 35 to 40 mph in urban areas. In specification language, the roads would be designed so that such speeds could be maintained during the 30th highest hourly volume of traffic (called the design hourly volume or DHV) envisioned for the year 1974.

The proposed operating speeds as well as the design speeds for interstate

(*Continued on page 42*)



Where the Highway Dollar Goes . . .



GRADE SEPARATIONS, getting railroads off arterial streets, can eliminate long traffic tie-ups. At Minneapolis, Franklin and Cedar avenues were blocked 20% of time (left) before extensive improvement (right) was put into service.

BOLD APPROACH is taken by many cities able to afford arterial routes. Narrow street in Philadelphia (left) was widened to 10 lanes (below) with extensive condemnation and viaduct lengthening.

LIMITED - ACCESS routes are among the highest types of urban improvement. This is a six-lane divided portion of Southwest Trafficway in Kansas City, Mo.

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The skilled manpower and complete mapping facilities which advanced the ground breaking date for this projected $583,000,000 Illinois turnpike system demonstrates how AERO methods can speed the vast highway programs now being planned by many States.

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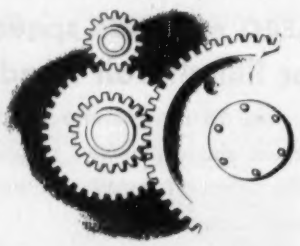

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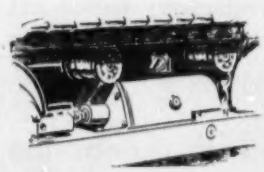

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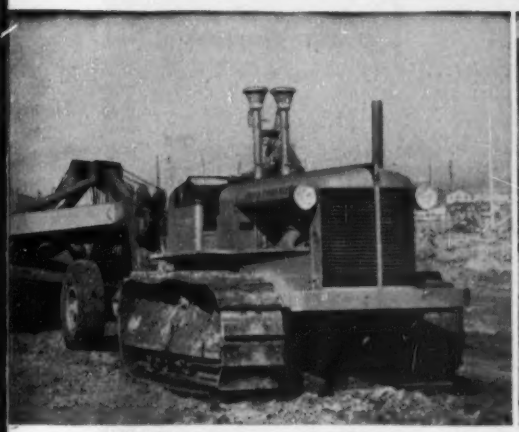

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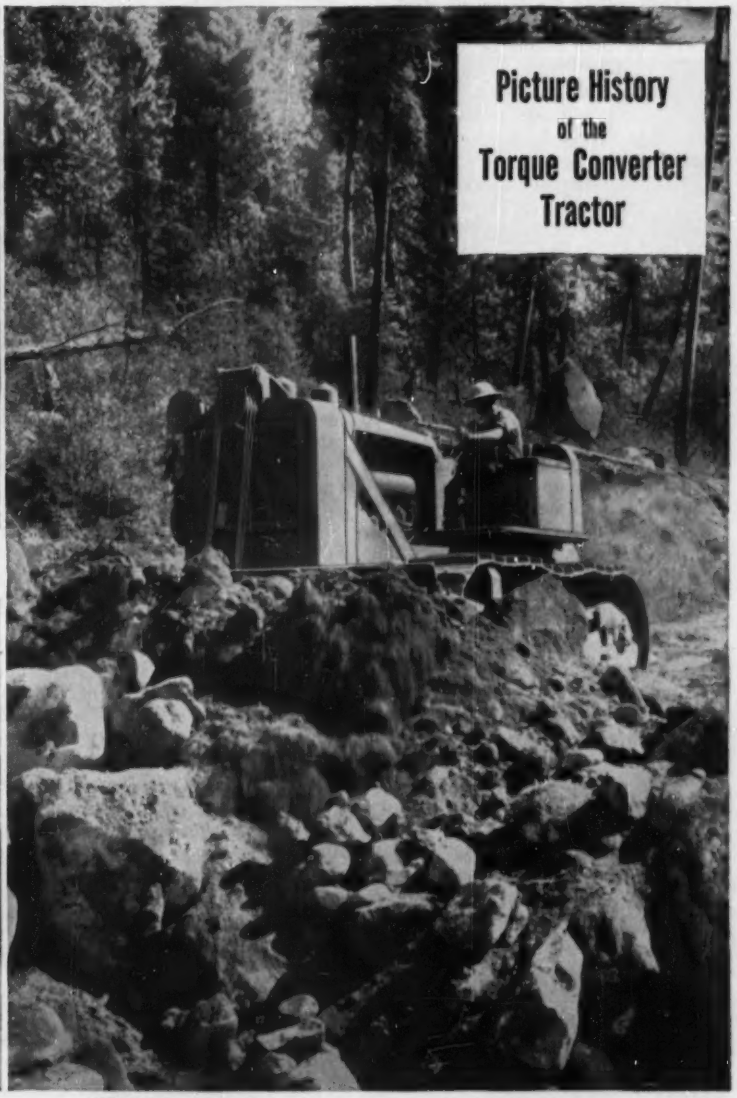


Picture History of the Torque Converter Tractor

1951 THE HD-20, 175 net engine hp, most productive tractor in the business.

1954 THE HD-15C, 135 net engine hp, brings advantages of torque converter to a new range of work.

roads in various types of terrain are given in the following table:

	Operating speed during DHV mph	Design speed mph
Rural		
Flat terrain	50 to 55	70
Rolling terrain	45 to 50	60
Mountainous terrain	40 to 45	50
Urban	35 to 40	50

If, in large cities, one route is not sufficient to carry the traffic at these speeds, a parallel route is to be built.

Full control of access would be provided initially on all interstate system sections having a DHV (1984) of 1500 in rural areas and 2000 in urban areas. Ultimate full access control throughout the system would be planned for.

Traffic lanes would be at least 12 ft wide. Rural roads with a DHV (1974) of 600 would be divided initially, and provision would be made to convert all sections ultimately. Some sections with traffic volumes less than 600 might be divided initially because of restrictive grades and curvatures. All highways in urban areas (5,000 population) would be divided.

Most of these divided highways would be four-lane, but where the DHV (1974) in one direction exceeds 1,800 in rural and 2,600 in urban areas, a six-lane divided highway would be provided initially, with provision made for six lanes on other sections where such volumes will be reached by 1984.

The usable shoulder width would be 10 ft except in mountainous terrain, where it could be reduced to 6 ft. Median strips in rural areas would be 60 ft in flat terrain and 30 ft in rolling terrain, and in urban areas from 15 to 20 ft. Exceptions are made in mountainous terrain, in difficult urban locations and on long structures, where a 4 ft median is permissible.

Grades would not exceed 3% in flat terrain and 5% in rolling, but with 6% permissible where its use would eliminate the need for introducing excessive curvature that would impair operating speeds and capacities.

All rural highways would have a 250 ft minimum right-of-way, except that 2-lane roads could have 180 ft minimum, but with additional reserved width for a 4-lane road and full control of access. In urban areas the right-of-way width would generally be sufficient just to accommodate the necessary cross-section elements, but would also include space for frontage roads wherever they might be needed.

All highway and railroad grade crossings would be eliminated except for minor crossroads with little chance of rapid increase in volume. Crossings of local and spur line railroads, where the DHV (1974) is less than 600, would be permitted to remain at grade initially.

The traveler on the interstate system of the future will hardly be aware that he is passing over the shorter bridges (up to 150 ft span), for they will be made wide enough to accommodate the full shoulder width of the highway. Many of these shorter structures will carry only one-way traffic, in which case the left clearance to the rail will be at least 6 ft. On longer structures, clearances to the rail (on left or right) will be a minimum of 4.5 ft.

On underpasses, too, the full shoulder width of the highway will be carried through the structure. And if a center pier is used it will clear the normal edge of the pavement by at least 6 ft. The clear height of all structures above the interstate highways will be a minimum of 14 ft, plus the thickness of future resurfacing, over the entire width including shoulders.

All structures over watercourses will have sufficient opening to pass a 50-year flood. They will also be high enough that their approaches will not be flooded.

All bridges will be designed for H20-S16 loading.

The only permissible variation from these specifications will be in certain congested urban areas, where normal right-of-way requirements or full controlled access demands would result in excessive damages to the community or the abutting property owners. In such cases, the interstate route will be carried around the congested area on a belt line, placed no farther away from the congested area than necessary.

At the end of 10 years, after investment of $24 billion, the interstate system would thus offer the traveler 40,000 miles of grade-separated, controlled access highway. And as much as 24,000 miles would be of divided roadway type, made possible both by entirely new construction and by adding lanes to existing pavement brought up to modern requirements by resurfacing.

Some of these roads would cost $5 million a mile, many more would cost as little as 4 per cent of that amount, as shown in an accompanying table. But for $600,000 a mile average, a great interstate system could be provided, linking all major cities and production centers with roads that could carry traffic with utmost efficiency and safety.

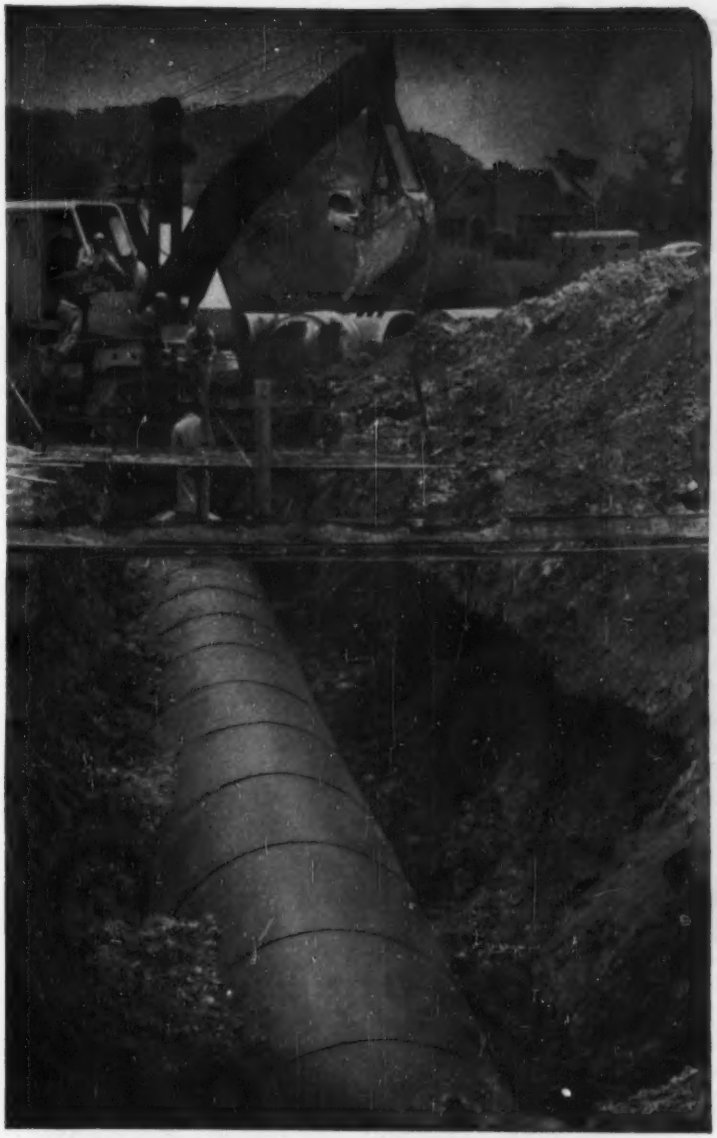
• Primary rural highways—Only slightly less important than the interstate system, the primary rural highway net, which includes all primary state roads whether they are on the federal-aid system or not, would also be subject to a high-type specification. This is evident from the tables (on page 46) showing, on the one hand, the tolerable conditions for existing roads and, on the other, the standards for new roads to replace existing roads where conditions are or will become less than tolerable.

On the primary system, all railroad grade crossings would be eliminated on existing multi-lane highways. On 2-lane highways intersecting multiple tracks crossings would be eliminated when the product of the number of

(*Continued on page 46*)

Average Cost Per Mile for a Complete New Road or Street

Road System	Cost/Mile (in $1,000) R. O. W.	Construction	Total
Interstate, Rural—2-Lane	$32	$205	$237
4-Lane	49	459	508
Over 4-Lane	134	1,005	1,139
Interstate, Urban—4-Lane	359	1,055	1,414
6-Lane	1,208	2,688	3,896
Over 6-Lane	2,453	5,366	7,819
Other F-A Primary, Rural—2-Lane	15	153	168
4-Lane	40	342	382
Over 4-Lane	182	948	1,130
Other F-A Primary, Urban—4-Lane	211	578	789
6-Lane	810	1,502	2,312
Over 6-Lane	1,000	1,819	2,819
Federal-Aid Secondary	17	100	117
Other Rural Roads	2	23	25
Other City Streets	35	105	140



Washington Suburban Sanitary Commission
Hyattsville, Maryland
Contract 69-D Chillum,
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John J. Smarge Co. Inc.
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54" Reinforced Concrete Culvert Pipe
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Tylox Flexible Rubber Coupled Vitrified Pipe	Ship Lap Wall Coping	Chimney Pots
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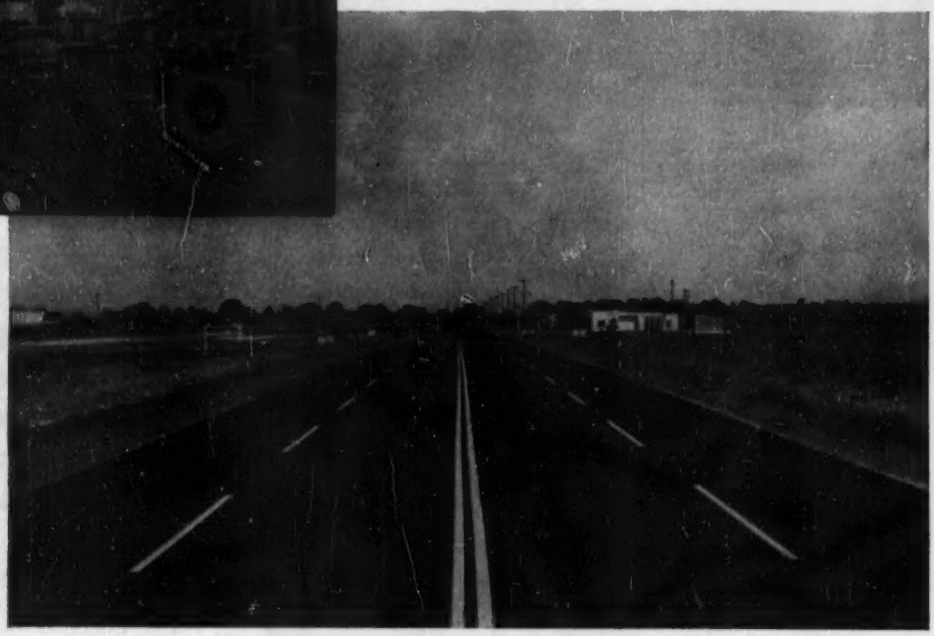
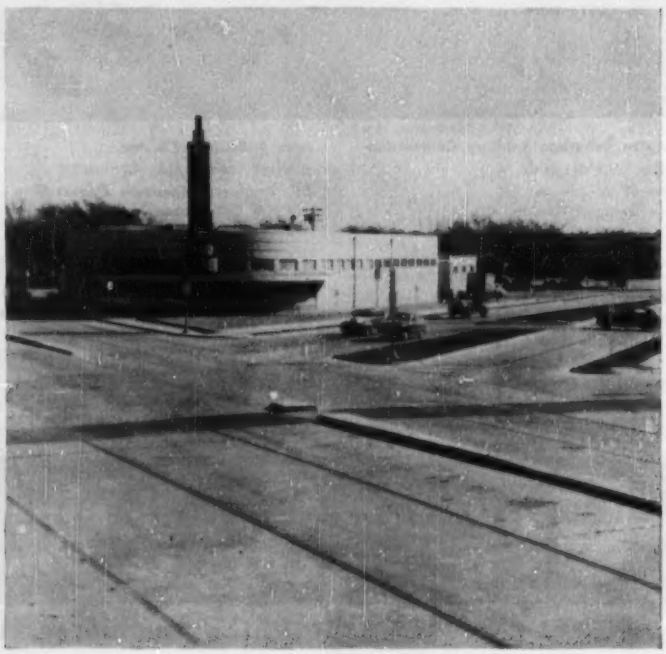
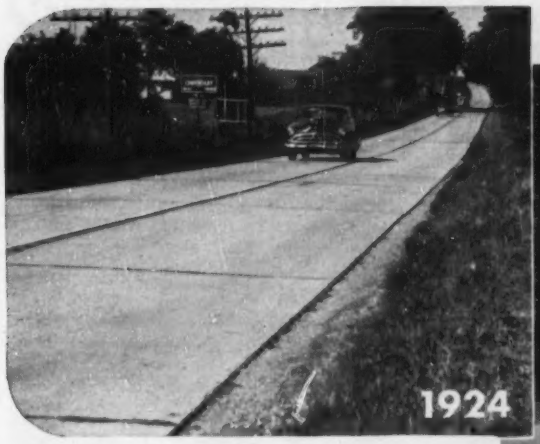
Where the Highway Dollar Goes . . .

BY-PASS ROUTES afford traffic relief with comparative low cost for small and medium-size cities suffering congestion from through traffic. Main Street at Bennetsville, S. C. (left) carried U. S. 15 until rural by-pass (below) was built.



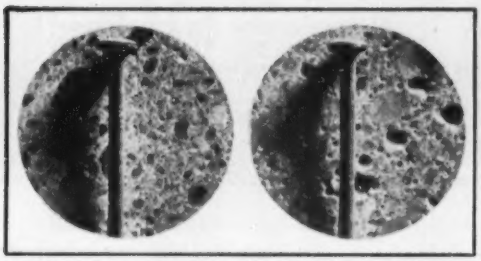
CHANNELIZING CURBS help motorists through complex intersections, speeding traffic flow. Inexpensive technique increases the capacity of existing city streets, as before and after checks on this Wichita, Kansas intersection demonstrated.





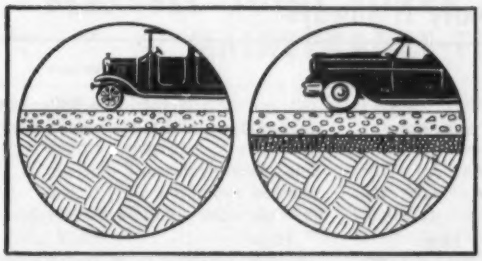
The 1924 road has served 30 years at low annual cost, but...

1954 CONCRETE ROADS ARE EVEN BETTER FOR THESE 3 IMPORTANT REASONS



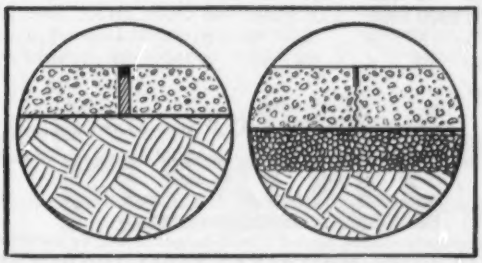
Non-air-entrained concrete (left) and air-entrained concrete. Pin shows size of air cells.

Concrete roads have come a long way since they brought the nation "out of the mud" 30 years ago. Many old pavements are still serving, but you can expect even better performance of modern concrete roads. One good reason is **AIR-ENTRAINED CONCRETE**, perhaps the greatest development in modern paving technology. Billions of microscopic air bubbles per cubic foot, produced by a resinous or a fatty additive, act as expansion chambers for freezing water. This trapped air eliminates damage to concrete pavements from weathering or the action of snow-removal chemicals.



Concrete roads used to be built on the soil (left). Now most get a granular base (right).

A GRANULAR SUBBASE is something you never see—a firm layer of crushed stone or gravel under the concrete pavement. Wet, unstable soil under the slab tends to squirt out at joints and edges under repeated impact of heavy traffic, leaving the pavement without adequate support. But a granular subbase provides good drainage that prevents this. On the now-famous Maryland Test Road, concrete slabs that were built on granular material survived six months of grueling durability tests—equivalent to more than 20 years of normal highway traffic—without a single failure of any kind.



Old type joint (left). Narrow, sawed joint of a modern concrete pavement (right)

SAWED JOINTS give you a much smoother ride. Years ago engineers thought they needed wide and frequent joints to accommodate the expansion and contraction of the concrete. Now they know they need only provide against uncontrolled cracking as the concrete shrinks. They *saw* a thin groove across the hardened concrete slab a few inches deep and seal it with material that won't squeeze out. Shrinkage causes a fracture line, invisible on the surface, to open below the sawed slot, which itself is so narrow it isn't felt and may not be seen by the motorist. For more facts get the free booklet, "*Why Concrete.*" It is distributed only in the U.S. and Canada.

PORTLAND CEMENT ASSOCIATION Dpt. 12e-17, 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

trains per day and the highway ADT (average daily traffic) of the design year exceeds 200,000 in rural areas and 400,000 in urban areas; and where the rural highway ADT of the design year exceeds 20,000.

On new construction, railroad grade separations would, of course, be provided for all 4-lane highways, and for others where the product of the number of trains per day and the highway ADT of the design year exceeds 50,000.

Highway grade separations would be provided on all new construction wherever either of the intersecting volumes would require more than three through-traffic lanes in each direction if an intersection at grade were employed to accommodate the DHV. Control of access is foreseen on the primary rural system whenever it is feasible on new construction involving an ultimate improvement to 4 lanes or wider.

• **Urban primary highways**—These highways, which include all the urban sections of the state systems, vary so widely in traffic loads and practicable possibilities for improvement that no single specification can be applied to them. Broadly, they would be considered deficient when the traffic demand equals or exceeds their possible capacities at some designated DHV. A specific route may be either of the major arterial or local street type, whichever will provide a satisfactory operating speed for the DHV.

The expenditure of $30 billion over ten years on the 195,000 miles of primary rural and urban primary roads, left after the 40,000 mile interstate system is taken care of, would provide another high class network of great local and regional serviceability.

Since the specifications apply also to state roads not on the federal-aid system—175,000 miles—these routes

(Continued on page 49)

Tolerable Conditions on Rural Primary Highways

Highway Type	Two-lane												Four-lane		
30th highest hourly volume estimated for 1964	Under 100			100–300			300–600			600–1000			Over 1000[1]		
Terrain	F	R	M	F	R	M	F	R	M	F	R	M	F	R	M
Design speed, mph	50	40	30	55	45	35	60	50	40	60	50	40	60	50	40
Surface width, ft	20	20	20	20	20	20	20	20	20	22	22	22	22	22	22
Surface type	Bit. Surf. Treat.			Intermediate			High			High			High		
Degree of curvature (max.)	9	14	25	7	11	18	6	9	14	6	9	14	6	9	14
Stopping sight distance, ft	350	275	200	415	315	240	475	350	275	475	350	275	475	350	275
Passing sight distance, ft	1700	1300	800	1800	1500	1000	2000	1700	1300	2000	1700	1300			
Grade, percent (max.)	7	8	10	6	7	9	5	6	8	5	6	8	5	6	8
Shoulder width, ft	4	4	2	6	4	4	8	6	4	8	6	4	8	6	4
Right-of-way, ft	Sufficient to maintain tolerable operating conditions														
Structures: Loading	H-15						H-15						H-15		
Structures: Roadway width curb to curb[2]	Tolerable pavement width						2 ft wider than tolerable pavement width								

[1] These four-lane divided highways become critically deficient where the volume in one direction exceeds 2400. Undivided sections are critically deficient where this volume exceeds 1500.

[2] Parapet or rail not less than 6 in. beyond face of curb.

Standards for New Construction on Rural Primary Highways

Highway type	Two-lane												Four-lane		
30th highest hourly volume for for 20th year after construction	Under 100			100–300			300–600[1]			600–800[1]			Total over 800, up to 2000 in one direction[2]		
Terrain	F	R	M	F	R	M	F	R	M	F	R	M	F	R	M
Design speed, mph	60	50	40	60	50	40	70	60	40	70	60	50	70	60	50
Surface width, ft	22	22	22	22	22	22	24	24	24	24	24	24	2 at 24	2 at 24	2 at 24
Surface type	Intermediate			High			High			High			High		
Degree of curvature (max.)	5	7	11	5	7	11	3	5	11	3	5	7	3	5	7
Stopping sight distance, ft	475	350	275	475	350	275	600	475	275	600	475	350	600	475	350
Passing sight distance, ft	2000	1700	1300	2000	1700	1300	2300	2000	1300	2300	2000	1700	.....	.....	.....
Grade, percent (max.)	6	7	8	5	6	7	4	5	6	4	5	6	4	5	6
Shoulder width, ft[3]	8	6	4	10	8	4	10	10	6	10	10	6	10	10	6
Median width, ft	....	....	....	....	....	....	....	....	....	....	....	....	30	15	4
Right-of-way, ft	80			100			120			120			200		
Structures: Loading	H15—S12						H20—S16						H20—S16		
Structures: Roadway width	50′ long or less—full shoulder over structure						80′ long or less—full shoulder						100′ or less—full shoulder		
	Longer than 50′—pavement +4′						Longer than 80′—pavement +6′						Over 100′—pavement +6′		

[1] Four-lane sections may be required at these volumes due to long steep grades or restrictive passing sight distances caused by curvatures. Or a climbing lane may have to be provided for trucks.

[2] A six-lane divided highway is necessary when the DHV in one direction exceeds 2000.

[3] Usable shoulder width to be stabilized where volume is greater than 200.

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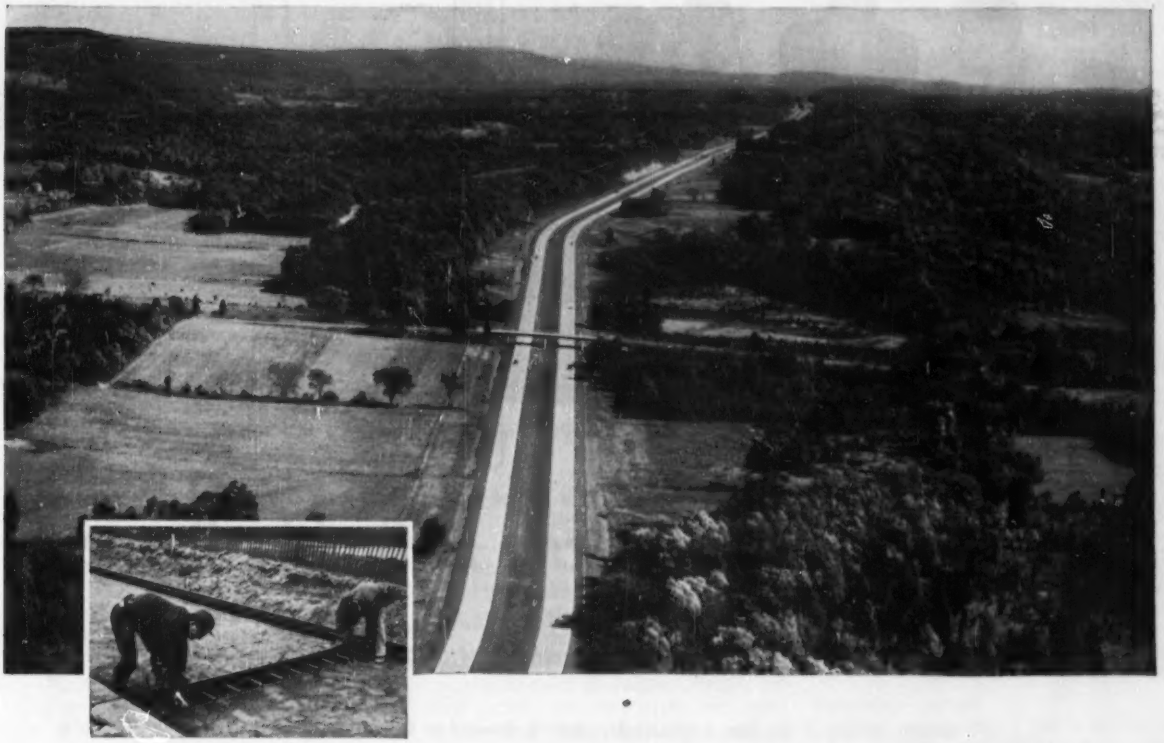
The New York State Thruway



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would also be upgraded. With tolerable operating standards set as high as they are, and with critically deficient sections being promptly removed and replaced with high standard new construction, growing traffic needs would be progressively met.

• **Other highways**—The extreme variations in the character of the roads outside of the interstate and primary systems—from country trails to city streets and the best in the federal-aid secondary system—make a common specification for improvement impracticable, except in most general terms. Thus it is contemplated that rural roads and city streets not included in the interstate or federal-aid primary systems would be improved when they become critically deficient according to established local policy. High volume routes would no doubt be subject to the AASHO standards for the federal-aid secondary system, as is present practice. In any event, all new construction would be such as to be adequate for 10 years.

Overall it seems clear that an annual investment of $10 billion in road-building over the next ten years would make every route in the country, from highest type to lowest, adequate to serve the traffic that desires to use it. Whether such a total-needs investment would be possible or whether it will be necessary to concentrate efforts on the roads of greatest inadequacy will be determined by the availability of money, which will be the subject covered by the next chapter of this report.

3. How Can We Finance the Roads We Need?

With both our needs for new highways and the kinds of highways we need established, the matter of financing takes first precedence.

The sum required for a ten-year total-needs program—$101 billion—is far greater than any that has been associated with highway improvement before. Actually, it is twice what we would spend if we continue to finance roads under the program and theory that now prevail. So the requirement is to find ways of raising an additional $50 billion, or some substantial fraction thereof, over the next ten years.

This was partly, if not largely, why President Eisenhower appointed the special advisory committee under the chairmanship of General Lucius D. Clay, and consisting of an industrialist—William A. Roberts, a banker—S. Sloan Colt, a construction man—Stephen B. Bechtel, and a labor leader—Dave Beck.

This committee has given the President definite recommendations on how about half of the needed extra $50 billion can be raised—by making the 40,000 mile interstate system a federal responsibility. It may also have had something to say on how the states could finance the remainder, but may not have gone very far into this area of the problem, on the theory that this was not within the realm of practicable federal help.

• **How to raise money**—In any event, we can consider the possibilities that are available for financing the interstate system—estimated to require about $26 billion over the next ten years.

There are two legitimate ways for governments to raise money: (1) by taxes or user fees, and (2) by borrowing, to be repaid out of future taxes or user fees.

One thing is obvious at the start: If there is to be borrowing, it will not be of a kind that would add to the formal national debt. After considerable difficulty, the Administration this year succeeded in getting Congress to boost the debt limit from $275 billion to $281 billion. The formal debt is now very close to this figure.

Nor is extra money for highways likely to be raised by higher federal taxes. The federal gas tax, for instance, is now 2¢ a gallon, and yields $1.1 billion a year. Another 1¢ per gallon might be expected to bring in another half billion dollars. But the Administration is trying to keep taxes down.

• **Pay as you use**—The solution, then, is this: If the $26 billion is to be raised at all, extra capital must be provided by borrowing against future taxes and user fees paid by those who use the highways. These include: federal and state fuel taxes, the federal oil tax, the federal excise on the wholesale price of motor vehicles, federal excises on auto parts and accessories, and state registration and license fees.

Revenue from all these sources—plus local special taxes and fees, and tolls—added up to about $6 billion in 1954. But if we had adequate roads, this might be expected to increase substantially from "induced" extra driving and extra car registration. While there is of course considerable uncertainty as to what this increase might be, some government economists figure the increase in fuel taxes, registrations, and ton-mile levies could average as much as $150 million a year over the next 30 years.

Not all of this money would be available for highway construction, even if it were all spent on highways. Of about $6 billion from all sources (including property taxes) spent on highways this year, about $2.1 billion went for maintenance, administration, and highway police compared with around $3.7 billion spent for construction. The rest went for interest payments.

But the federal share of this highway-user revenue (what the U. S. takes in now and the estimated future increases) would readily meet interest and amortization on federal revenue bonds to finance the interstate highways and leave enough to continue federal aid to the other systems. In this connection, General Clay has indicated that federal-aid appropriations to the states might have to return to the present level of $550 million a year instead of continuing at the $875 million figure which goes into effect this year.

The arithmetic works like this: Assuming $2.6 billion of 30-year revenue bonds were sold each year at 3%, it would cost about $133 million each year on a level-annuity basis to retire the bonds. Secured by future revenue from the federal gas and oil taxes, the bonds could be sold outside the regular Treasury debt by a federal agency which could then allocate the money to the states for construction of the interstate system.

This, or something like it, will probably be the financing pattern that could provide $26 billion over 10 years for the interstate network. And the hope is that the increased amount of state highway-user revenue generated by a modernized interstate system would ultimately give state road programs a needed boost.

At any rate, this increase in revenue should make it possible for the states to maintain their share of the projected $4.7 billion annual spending on highways outside the interstate net, in spite of any reduction in federal aid.

• **New thinking**—This is a bold financing concept. It is based on faith in the continued peace and prosperity of the U. S. And it shows that our thinking about highway finance has changed a great deal since the automobile started revolutionizing transportation a half-century ago.

In those days, state and local property taxes provided practically all the money that was spent on highways. They still provide—in direct taxes and in borrowing based primarily on the property-taxing power—about half the

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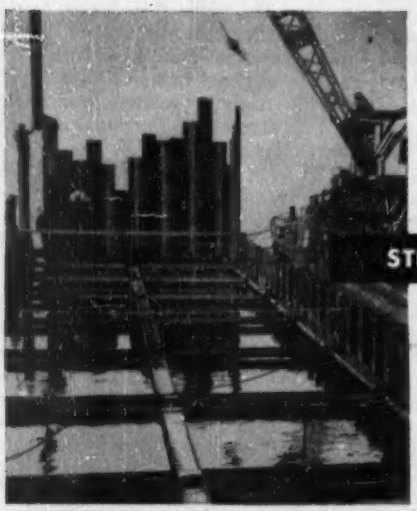

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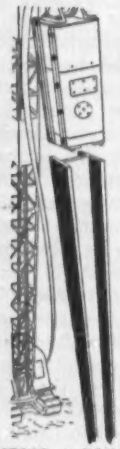

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Normal Construction Expenditures All Roads and Streets, 1955-1964

(Based on Current Tax Rates and Authorized Borrowing)[1]

Year	Amount (Millions) During Year	Accumulative
1955.....	$4,600	$4,600
1956.....	4,750	9,350
1957.....	4,950	14,500
1958.....	5,100	19,400
1959.....	5,250	24,650
1960.....	4,200	28,850
1961.....	4,300	33,150
1962.....	4,400	37,550
1963.....	4,550	42,100
1965.....	4,700	46,800

[1] Funds to meet these expenditures would come from: State road users revenues, $27.5 billion; Federal funds, $8.3 billion; Bond proceeds, $6.3 billion; Local property tax and general revenue, $4.7 billion.

money spent on roads by counties and local governments.

But very early in the Automobile Age it became obvious that property taxes could not bear the whole highway burden. The automobile, which was making the highway problem more complex, itself provided part of the solution in the form of user fees. Generally, the states insisted on levying these relatively painless taxes themselves, and passing part of them on to local governments for roads and streets.

The federal government started its aid program in 1917, gradually boosting grants until today it provides about 20% of capital spending on highways. The federal gas tax began in 1932 at 1¢ per gallon and reached 2¢ in 1951. Though the proceeds of this tax have no legal relation to federal aid, they provide more than enough for the present grants to the states.

• **Dispersion**—But in spite of the increasing amount of money being spent on highways, they can not be improved fast enough to meet traffic demands. This has been particularly true of the primary road net—including the 40,000-mile interstate system—because road money has a way of getting dispersed over a very wide network, where the benefits to local users are more obvious than along a few superhighways.

From a theoretical standpoint, of course, this dispersion of highway funds is all wrong. If the purpose of a highway system is to be of maximum usefulness to the greatest num-

Compare these features...

- ✓ 20% to 40% lighter than other buckets, type for type.
- ✓ All-welded construction for greater strength and durability.
- ✓ 14% Manganese Steel Chains, fittings and reversible tooth points.
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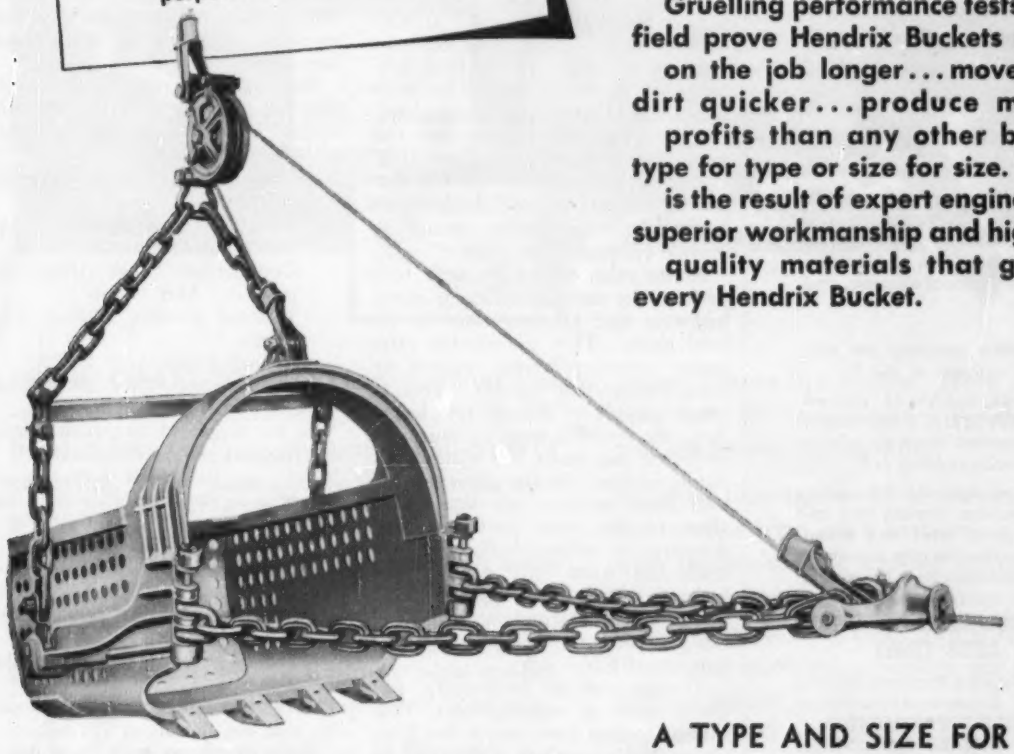
Something to tack up and remember!

Gruelling performance tests in the field prove Hendrix Buckets stay on the job longer... move more dirt quicker... produce more profits than any other bucket, type for type or size for size. This is the result of expert engineering, superior workmanship and higher quality materials that go into every Hendrix Bucket.



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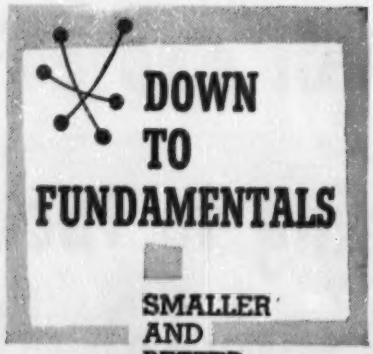

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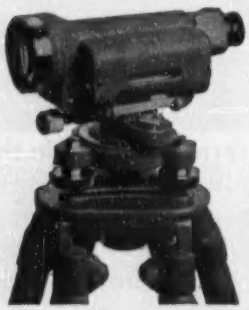

The NK3 offers over 100 years of Swiss Master Craftsmanship and the latest technical achievements compressed into 4 lbs. of maximum precision, operational efficiency and economy.

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Needed Interstate System Improvements

Miles Needing Improvement—35,215[1]
Construction Cost, 1955–1964—$23,914,000,000[1]

	Rural		Urban	
	Miles	Cost ($ Millions)	Miles	Cost ($ Millions)
2-Lane	8,128	$1,631	51	$23
4-Lane	22,923	9,897	1,999	3,157
6-Lane	659	600	1,097	4,484
Over 6-Lane	66	124	292	2,920
Contingencies, Stop Gaps	.....	800	.....	278
	31,776	$13,052	3,439	$10,862

[1] Total miles presently designated for the interstate system is 37,800 of a legally permissable 40,000. Bringing the entire 40,000 miles up to modern standards is estimated to require $26 billion.

ber of people, highway-user funds should be concentrated on primary highways before bringing other roads up to top condition.

Nevertheless, secondary roads are essential to the primary network. They provide the main roads with much of their traffic. But on a per vehicle-mile basis, secondary roads cost the most to build, in spite of their relatively low standards. So it is generally impossible to finance them completely out of over-all state highway-user fees without resorting to property taxes. Gasoline taxes and other user fees that can be assigned to rural roads on an income basis just aren't enough to provide adequate local roads.

At the other end of the scale, tolls perform the same function for superhighways that property taxes do for local roads. They provide the extra money necessary for the modern superhighways that gas-tax revenues cannot supply at present rate levels. And, incidentally, most existing and projected toll roads are planned as self-liquidating on the basis of the tolls alone, without any attempt to allow for the extra gas-tax revenue generated by induced traffic. But toll roads can solve only part of the highway problem, since those already built, under construction, or having fair prospects for being built, total only about 6,000 miles.

The pressure for local roads, and the necessity of superhighways: That is the Gordian knot which the Clay Committee's proposal is designed to cut. Under it the federal government, by means of revenue bonds, would pay all, or practically all, of the $26 billion which it has estimated will be needed to bring the interstate system up to 1974 standards by 1964. This is a new approach to the highway problem, designed to meet at least half our extra highway needs and to put the states in a better position to tackle the other half.

Is the market big enough?

Will there be buyers for an extra $2.6 billion of highway revenue bonds each year? To arrive at an answer to this question, it is necessary first to have an idea of the size of the capital market, that nebulous Rialto where investors of long-term funds meet borrowers.

Here are the major investors of long-term money and the estimated volume of new funds they invested in 1954:

Life insurance companies — $6 billion
Savings & loan associations — $4-billion
Commercial banks (time deposits) — $3.4 billion
Trusteed pension funds — $1.5 billion
Savings banks—$1.8 billion
Foundations, other institutions, individuals—$2.5 billion

So the supply of long-term money this year was about $19 billion.

Here are the major borrowers of long-term money, and what they borrowed this year:

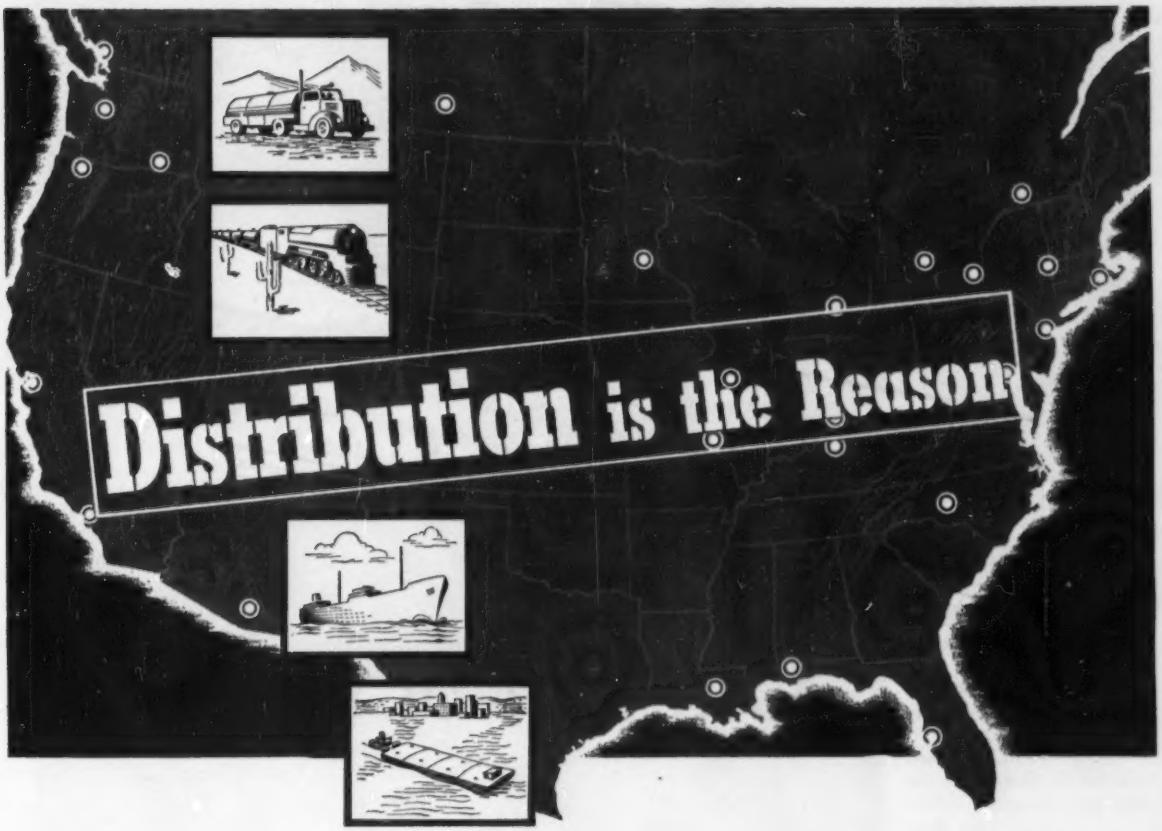
Corporations—$4.2 billion
State and local governments — $5 billion.
Mortgages (mostly residential)—$10 billion
Federal government—nothing this year

So the demand for long-term money this year was also about $19 billion.

These figures are on a "net" basis. They show the net increase in assets on the side of the lenders and the net increase in debt by the borrowers. Any difference between new money coming into the capital market and borrowers' demand could be explained by the sale of serial bonds running up to about 15 years in maturity, purchased by commercial banks through the creation of demand deposits.

(*Continued on page 58*)

BITUMULS® Gains in Nationwide Acceptance



FROM COAST-TO-COAST throughout this country, an ever-increasing number of Roadbuilders are specifying Bitumuls for all types of surfacing. These men specify Bitumuls for two good reasons:

1. They know that they can get Bitumuls *when and where they need it,* in the quantity and grade required.
2. They can depend on uniform high quality asphalt emulsions when they specify Bitumuls.

Back of this ready availability of Bitumuls is a system of distribution that is without parallel in the industry. From our many refineries and plants, Bitumuls moves in steady stream — by truck, rail, boat, or by barge — to local storage-points across the nation. Here it is held in readiness for immediate job-delivery or for pick-up by the Roadbuilder.

National distribution is, of course, only one of the reasons why more surfacing is being done with Bitumuls. Cold-applied emulsified asphalt in this modern, convenient form offers important savings in time, labor and equipment. New illustrated booklets, available on request, give full technical information and methods of application. Write for your copies today.

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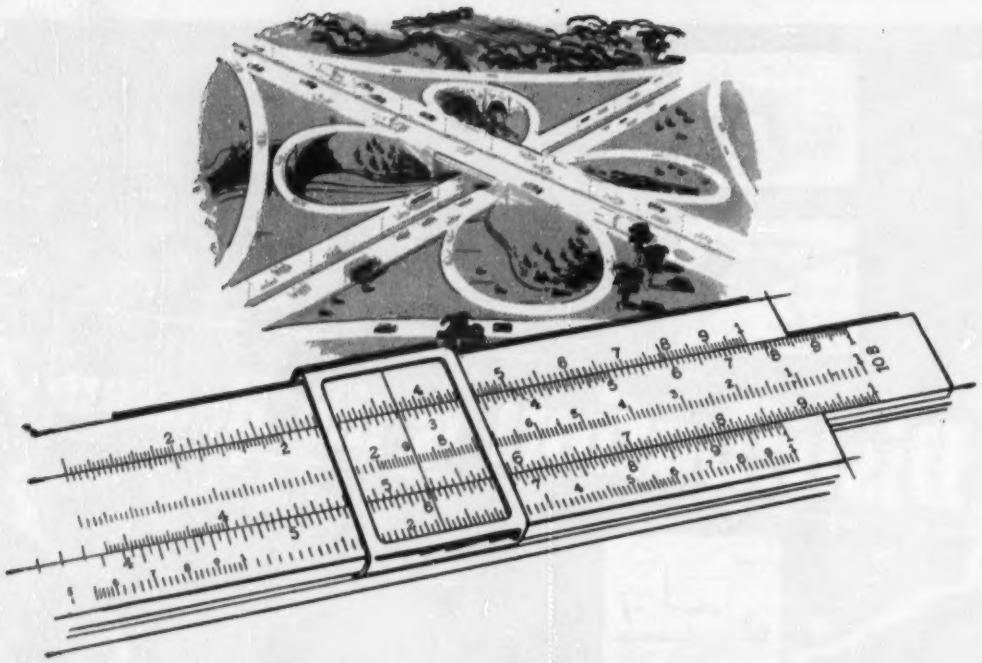


Our sort of report

Yes—and in more ways than one.

For this detailed report by Engineering News-Record takes the careful, slide-rule approach that we, as engineers, like to use in tackling such a problem.

And, of course, the highway problem itself is one that deeply concerns us. In fact we have devoted much thought, time—yes, and money—both toward hunting solutions and—just as important—in encouraging public interest in finding solutions.

As Harlow H. Curtice, President of General Motors, wrote in the Report on our national "Better Highways Awards Contest" two years ago:

"We hope our contest has helped to set in motion a continuing wave of public discussion and understanding of the highway problem, and a persistent public demand that it be solved . . . The road problem is a composite of many problems, and each of them must be solved individually. But no road improvement program can succeed without public understanding and public support."

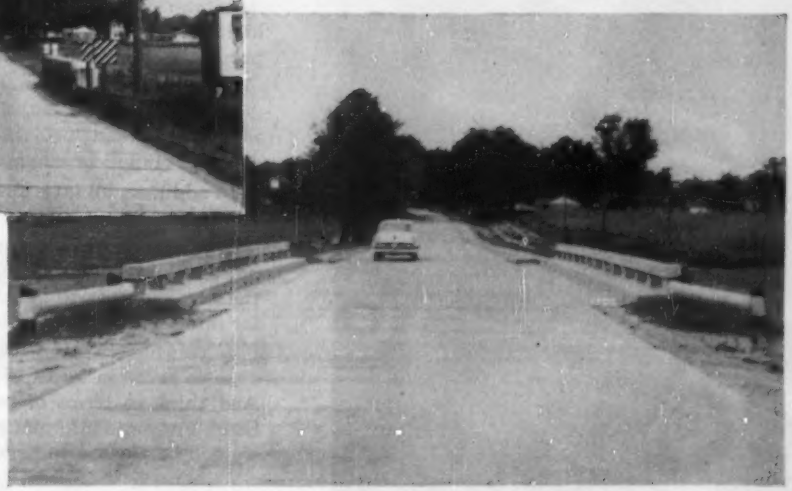
So you can readily see how sincerely we welcome this account of the newly emerging highway program—so impressively set forth in this issue.

GENERAL MOTORS

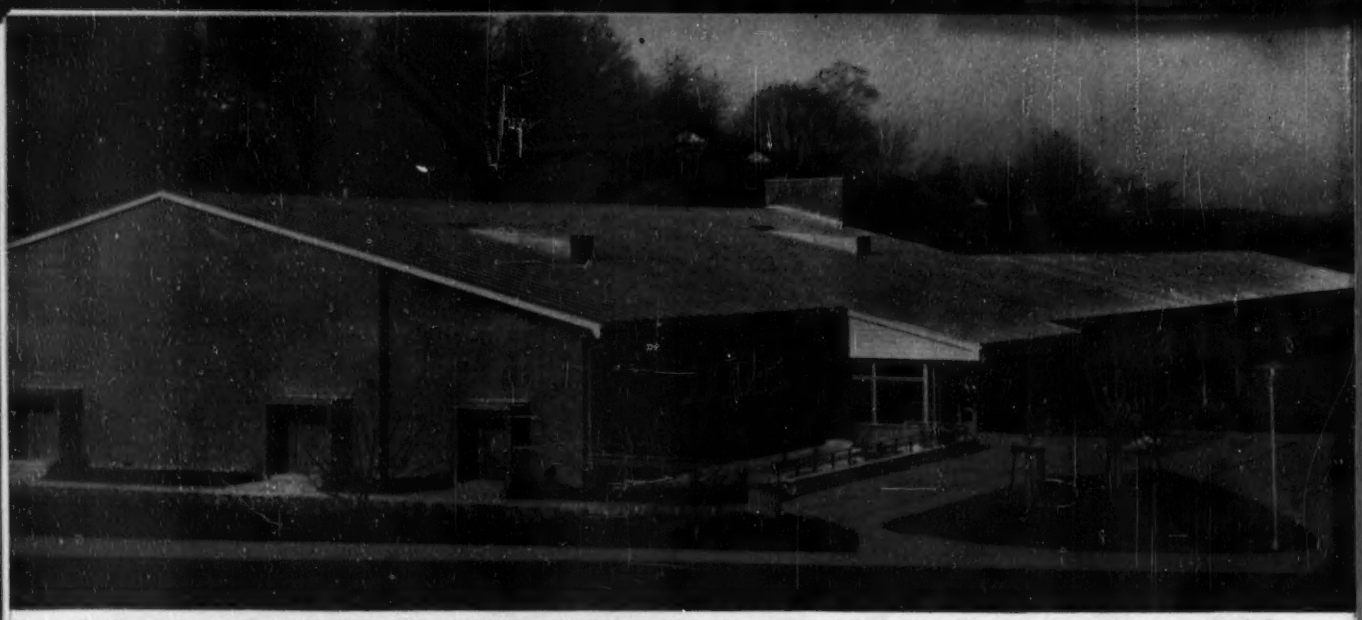
Where the Highway Dollar Goes . . .

ARCHAIC trusses still blight the highways. Collapse is not uncommon, but states are modernizing when the money is available. These are before-and-after views at a Maryland site. Deck-type bridges prevail for most replacements in this class.

DECK-TYPE replacements also are popular in the larger sizes. Here one picture shows the old and the new. Swing bridge across Neches River in Texas (at right) was dangerous two-lane bottleneck. Four-lane bridge at left takes traffic unimpeded over navigable way.



DEATHTRAP small bridges with narrow roadways between hazardous parapets abound on our rural roads. Some are being superseded by safe structures as this Illinois before and after example shows. Many more need to be eliminated.



THE ROOF of the new Walnut Grove School, West Mifflin Borough, Allegheny County, Pa., is USS Stainless Steel. Architects: Button and McLean, Pittsburgh, Pa. Contractor: Nicholas Le Donne, Clairton, Pa. Roofing contractor: Limbach Company, Pittsburgh.

New Walnut Grove School has a maintenance-free roof of

● The school board of West Mifflin Borough, Allegheny County, Pennsylvania, took care of roof maintenance almost permanently when the new Walnut Grove School was built. They did it by specifying a roof of long-lasting USS Stainless Steel.

The roof is approximately 385 feet long and 75 feet wide. The Stainless Steel roofing panels have a satin-type architectural finish. They are of 26-gage material fabricated into a standing seam panel 27⅜" wide by 12 feet long.

Stainless Steel's superior corrosion resistance, combined with its almost complete freedom from maintenance, fits it for years and years of satisfactory service. It has excellent reflective properties, and features needed strength with light weight.

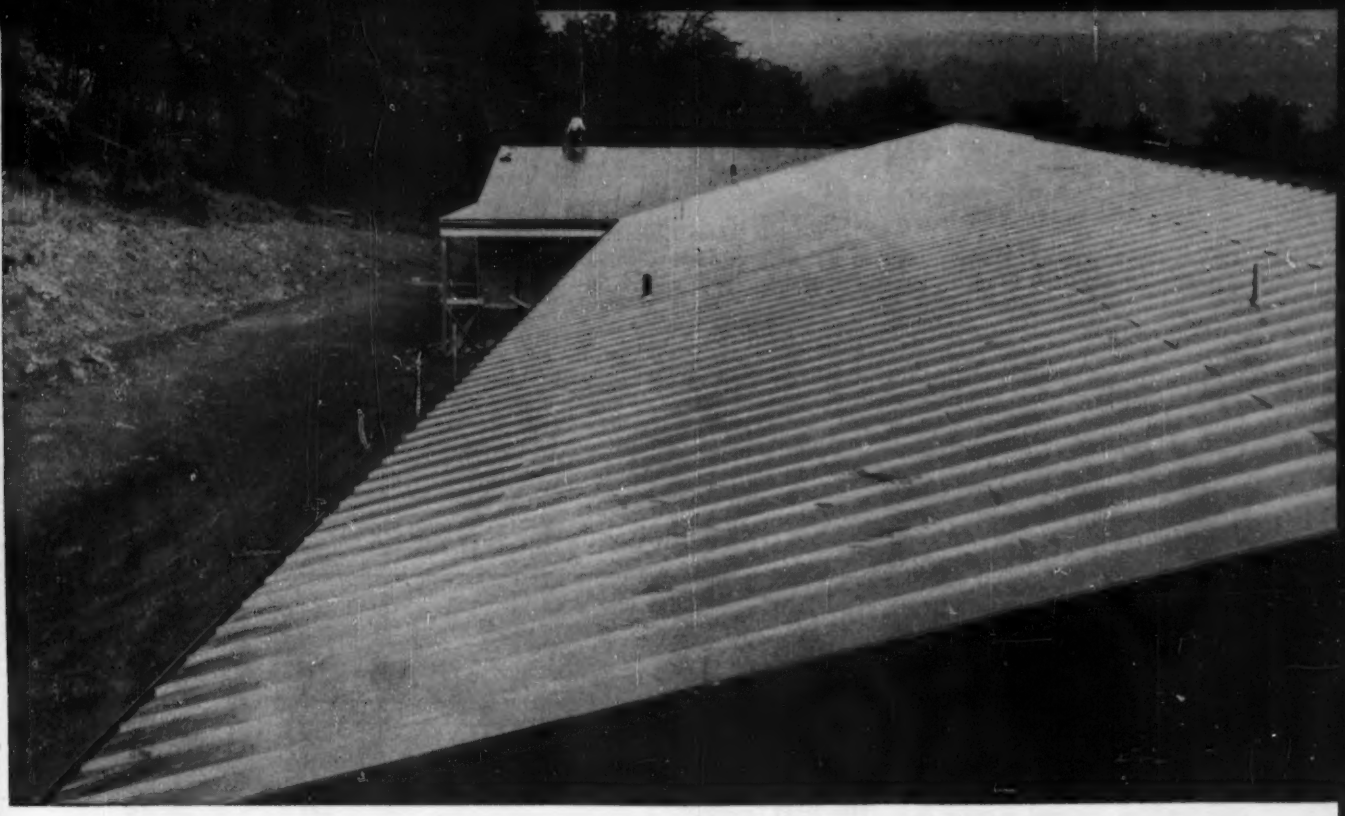
The Stainless Steel roofing sheets are laid on double-coated, 35 pound asbestos felt. Each cross seam is caulked and the roofing is locked into the Stainless Steel gutter. Gutters and downspouts are of 22-gage Stainless Steel, architectural finish.

In addition, all attachments, supports, hanger bars, bolts and screws are Stainless Steel.

Stainless Steel is finding wide favor with school architects, not only for roofing, but for exterior walls as well when used in the form of insulated panels. Of course, its wonderful possibilities for interior trim are also being used to advantage.

If you have a new school in the planning stage, now is the time to think in terms of Stainless Steel and its many benefits. And think in terms of perfected, service-tested USS Stainless Steel. For more information, mail the coupon below. If you like, we will be pleased to have one of our representatives call.

◀ INSTALLING the standing-seam USS Stainless Steel roof on the new Walnut Grove School. The roof was laid on double-coated asbestos felt with each cross seam carefully caulked before the upper sheet was installed.



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Now add to the demand side of this equation some $2.6 billion or more in long-term highway bonds each year over the next decade. Will there be enough buyers? And will borrowing costs be reasonable?

• **Bond assumptions**—Answers to these questions must rest on broad assumptions. For example, there is likely to be a sizeable increase in school bonds over the next decade, averaging perhaps another $2 billion each year. To finance their share of the projected $4.7 billion annual spending on highways outside the interstate net, states and other local agencies may have to borrow an additional $1 billion above the present level. We can assume that the demand for mortgages will stay at a high level, perhaps at least $9 billion each year through the decade. Corporate demand for new money might average $5 billion annually. It's especially difficult to forecast what regular federal borrowing would be. So we might assume it will be on the average about $0.5 billion each year.

On the supply side, too, we can reasonably expect an increase in available funds as national income rises and individuals put more savings into life insurance policies, thrift accounts, pension funds, and so on. Perhaps the total supply might increase at an average rate of $0.5 billion a year.

In 1960, then, half-way through the 10-year period, we might find that the demand for long-term money would be about $22.5 billion, and the supply perhaps $22 billion.

• **Bank financing**—The difference between supply and demand could be made up, without raising interest rates to any great extent, by selling short-term and intermediate-term securities to commercial banks, who would pay for them by creating demand deposits. This would not necessarily be inflationary, since the money supply must expand with a growing economy.

Under certain conditions, spending this much extra money on highways in 10 years could be inflationary while construction was going on. But balanced against it would be great cost savings to commercial and individual users of a modernized highway network.

From all this it may be concluded that financing the interstate system over 10 years is quite possible. If, after the first few years of the construction program, it turned out that federal gas-tax revenues were not coming in fast enough to pay interest and amortization on the bonds, the program might have to be slowed down until revenues caught up. Alterna-

Table I—Summary of Toll Roads[1]

	Length, Miles	Cost
Toll Roads in Service	1,465[2]	$1,836,800,000
Toll Roads under Construction	920[3]	1,733,400,000
Proposed Toll Roads	3,719	4,530,400,000
	6,104	$8,100,600,000

Footnotes:

1 This tabulation does not include toll bridges or tunnels.
2 This figure includes 31 miles of the New York State Thruway and 15 miles of the Garden State Parkway that are not yet in service.
3 This figure includes 22 miles of the Ohio Turnpike No. 1 that were put into service on Dec. 1, 1954.

Table II—Toll Roads in Service

Name (arranged regionally)	Length, Miles	Cost
Maine Turnpike	47	$20,600,000
New Hampshire Turnpike	15	6,800,000
Merritt and Wilbur Cross parkways, Connecticut	67	38,000,000
Westchester County (N. Y.) parkways	26	25,000,000
Long Island (N. Y.) toll parkways[1]	31	34,300,000[1]
New York State Thruway	427[2]	587,000,000
New Jersey Turnpike	118	285,000,000
Garden State Parkway, New Jersey	164[3]	353,000,000
Pennsylvania Turnpike (including Delaware River ext.)	360	305,500,000
Buccaneer Trail, Florida[4]	17	4,600,000
West Virginia Turnpike	88	133,000,000
Turner Turnpike, Oklahoma	88	38,000,000
Denver-Boulder Turnpike	17	6,000,000
	1,465	$1,836,800,000

Footnotes:

1 Includes cost of widening only on toll section of Southern State Parkway.
2 396 miles in service at end of 1954.
3 149 miles in service at end of 1954.
4 The Overseas Highway to Key West, Florida was converted from a toll to a free road during 1954.

Table III—Toll Roads Under Construction

Name or Location, by Regions	Length, Miles	Estimated Cost
Maine Turnpike Extension, Portland to Augusta	66	$55,200,000
New Hampshire, Massachusetts line to Concord	40	22,500,000
Massachusetts East-West Toll Road	123	239,000,000
Connecticut, Greenwich-Killingly Expressway	129	398,000,000
New Jersey Turnpike, Hudson County Extension	8	114,000,000
Link to Pennsylvania Turnpike	6	27,200,000
Pennsylvania Turnpike extensions		
Link to New Jersey Turnpike	1	233,000,000
Philadelphia to Scranton	110	
Ohio Turnpike No. 1, Penn. line to Indiana line	241[1]	326,000,000
Indiana East-West Toll Road	156	280,000,000
Kentucky, Louisville to Elizabethtown	40	38,500,000
	920	$1,733,400,000

Footnote:

1 22 miles put in service Dec. 1, 1954.

Table IV—Proposed Toll Roads

(Projects authorized or under study by public agencies)[1]

Name or Location, by Regions	Length, miles	Estimated Cost
New Hampshire; Portsmouth to Rochester	24	$14,300,000
Rhode Island; Hopkinton to Tiverton	40	53,000,000
New York State Thruway extensions		
Erie Section, Buffalo to Penn. line	70	100,100,000
Niagara Section, Buffalo to Niagara Falls	21	102,500,000
Berkshire Section, Albany to Mass. line	24	62,000,000
New England Section, N. Y. City to Conn. line	15	111,000,000
Connecticut to N. J. Turnpike or Parkway	5	[2]
New Jersey: Garden State Parkway link to N. Y. Thruway[3]	12	23,500,000
New Jersey Turnpike extension		
East-West Turnpike to Delaware River	55	300,000,000
Widening 61 miles from four to six lanes		25,000,000
Pennsylvania Turnpike extensions		
Northwestern extension and N. Y.-Ohio link	185	300,000,000
Gettysburg extension	30	50,000,000
Maryland; Baltimore to Pennsylvania line	48	29,500,000
Baltimore by-pass, Patapsco River tunnel	14	97,000,000
Virginia; Richmond to Petersburg[4]	36	56,000,000
West Va. line to North Carolina line at Mt. Airy[4]	75	90,000,000
Virginia-North Carolina Coastal Highway	50	3,400,000
North Carolina; Mt. Airy to So. Carolina line	125	200,000,000
Florida; Ft. Pierce to Hollywood	110	89,000,000
Jacksonville to Ft. Pierce	214	95,000,000
Titusville to Clearwater	130	80,000,000
Ohio Turnpike No. 2, Cincinnati to Conneaut	291	377,900,000
Toledo spur, Columbus to Michigan line	117	146,200,000
Michigan; Rockwood to Saginaw	155	186,000,000
Ypsilanti to New Buffalo	176	200,000,000
Indiana; Jamestown to Hammond	132	178,000,000
Illinois; Chicago bypass-Indiana line to Wisconsin line	80	390,000,000
Chicago to Rockford and Beloit	88	
Chicago to Aurora	25	
Aurora to Dixon and Rock Island	128	173,000,000
East St. Louis to Indiana line	153	
Calumet Skyway	7	88,000,000
Iowa; Davenport to Council Bluffs	298	180,000,000
Nebraska; Omaha to Lincoln	65	40,000,000
Louisiana; Lutcher to Lafayette	80	100,000,000
Kansas; Kansas City to Topeka, Wichita and Oklahoma line	236	160,000,000
Oklahoma; Kansas line to Oklahoma City	96	63,000,000
Oklahoma City to Texas line near Wichita Falls	128	83,000,000
Tulsa to Missouri line near Joplin	86	68,000,000
Texas; Dallas to Ft. Worth[5]	30	58,000,000
Washington; Tacoma to Everett	65	158,000,000
	3,719	$4,530,400,000

Footnotes:

1 This table includes only projects authorized by state legislatures or under study by state agencies. Some authorized projects that now appear to have little chance of being built in the near future have been omitted.

2 Cost of this connection included on cost of the main trunk of the New York State Thruway in Table II.

3 The New York State Thruway Authority has power to build a connection to either or both the New Jersey Turnpike or the Garden State Parkway. Plans for the latter appear to be farthest advanced at the present time.

4 Private corporations were set up in Virginia to build both these projects, but current plans are for their construction by the State Highway Department if they are built.

5 Private corporations were granted state charters in Texas to build this project and about 700 additional miles of toll highways. The State Highway Department now has authority to build this project and soon will have exclusive powers to build toll roads in Texas.

tively, federal gas taxes could be raised, or state highway-user funds tapped, or tolls collected through barrier stations on the interstate system.

Naturally, a world war or serious depression would cause this program a lot of trouble. World war would be much more serious, since it would mean gas rationing and the rationing of construction materials. The program could be kept going through a depression, if the Administration then in power were willing to resort to more inflationary financing methods.

What about toll financing?

A major question for which there is no definite answer is the place of toll financing in the greatly expanded highway-building program. Only this is clear: Both the Bureau of Public Roads and the Eisenhower Administration consider bringing the existing toll roads into the interstate system wherever that is possible; and both are exploring the possibilities of toll financing in the new program to the fullest extent.

For the Bureau of Public Roads, this is a new approach to toll roads. For many years past, because Congress had decreed that no federal aid was to go to toll roads, BPR looked upon them as outside of its planning and thinking. But in the new planning, existing toll roads, or new ones that may be built, will be made a part of the interstate system if located along routes designated as part of that system.

• **An uncertain future**—What makes the future of toll financing so unclear is the probability that the President will recommend to Congress that the federal government pay all or the greater part of the cost of rebuilding all roads in the 40,000-mile interstate system. With few minor exceptions, every highway now being considered for toll financing lies along a route that is part of the interstate net. Hence, if the federal government now proposes to rebuild all the deficient sections of that network at its own expense, there will be no need for any state to plan to do the same thing by means of private toll financing. That could sound the death knell of every toll road project not actually financed when the new highway act goes into effect.

On the other hand, Congress might decide that, in view of the magnitude of the program it is undertaking, it should seek to get as much money from tolls as possible. To do that, it could have the federal government: (1) pledge "if needed" funds to any project that can make a reasonable showing of

(Continued on page 62)

Part of a 13-mile installation of "Century" Pipe, Lakewood Water District, near Tacoma, Wash.

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"CENTURY" PIPE

is made of asbestos fiber and portland cement—two practically indestructible materials. It cannot corrode. Therefore, the replacement and maintenance expense necessitated by corrosion and tuberculation, when some other types of pipe are used, is eliminated.

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3. EXCEPTIONALLY STRONG
4. DURABLE
5. IMMUNE TO ELECTROLYSIS
6. TIGHT JOINTS
7. SMOOTH BORE
8. EASILY, QUICKLY LAID
9. LIGHT WEIGHT
10. LOW COST

"Century" Pipe meets the A.W.W.A., A.S.T.M. and Federal Specifications for asbestos-cement pressure pipe.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

Nature made asbestos . . . Keasbey & Mattison has made it serve mankind since 1873

Where the Highway Dollar Goes . . .

AUTOMOBILES MADE THEM and automobiles wore them out. Many concrete roads built in the 'Twenties and later have seen their day. They are fine bases for new surfaces, though, as on this asphalt-topped oceanside highway in New York.

RECONSTRUCTION also is called for where stepped-up traffic densities have wrecked lower-type paving that had been adequate for the needs of its day. Ohio road (left) has been widened and paved with concrete (right).

TOLL ROADS built or building are expected to be made part of the basic interstate system where possible under the new planning. Roads shown as proposed include only those currently planned or under study by state agencies.

earning sufficient income after a few years of operation, or (2) could grant some outright aid to pay part of the initial cost of such projects.

• **Toll-financing possibilities**—At the present time there are nearly 1,500 miles of toll roads in service and over 900 miles under construction. Most of this mileage has been financed by the sale of bonds backed only by potential income from tolls and concessions. In addition, other toll-road projects, totaling around 4,000 miles, are under study by state agencies to determine whether they can be financed in the same way. Even though all of this mileage could be completely financed through private sources, which is highly improbable, the total of existing and potential toll roads still would be only about 6,000 miles as compared to 40,000 in the interstate network.

In response to a request from the Bureau of Public Roads, the state highway departments now are making an intensive study of the entire interstate system to determine what sections might be financed by tolls. That this study will reveal any large mileage as being able to produce enough toll income to attract private capital without some state or federal support seems improbable in view of the fact that several toll-road projects for heavily traveled routes in Midwestern states have been found to be of questionable value as revenue producers in recent studies by private consultants.

• **Partial toll financing**—However, even though this study does show that the mileage that could be fully financed through private sources is small, that finding would not rule out partial toll financing for a large part of the system.

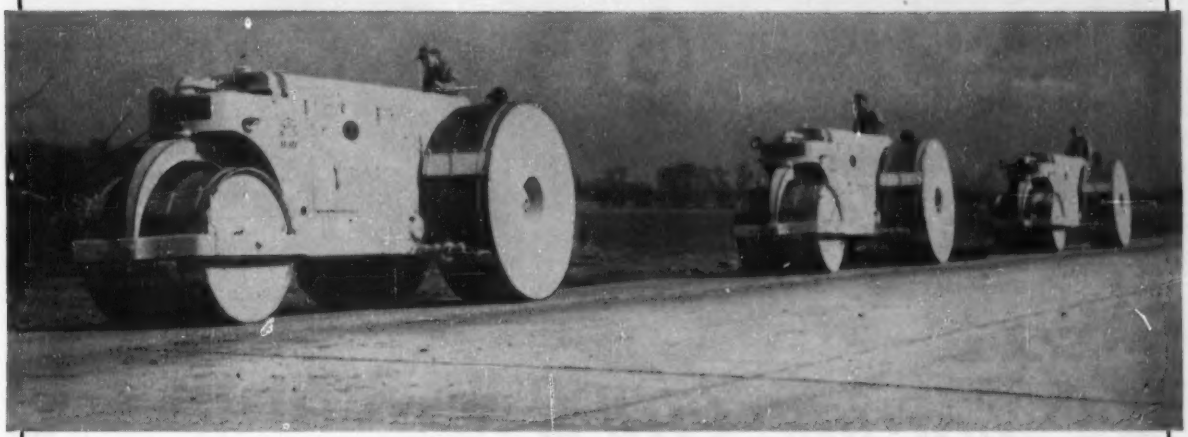
Collection of tolls at a limited number of barrier-type gates offers an attractive way to finance part of the cost of projects that cannot be financed through a completely closed

FIVE HUBER-WARCO

Variable-Weight 3-Wheel Rollers

Help Build 8-Mile Section of

OHIO TURNPIKE



VERSATILE ROLLERS COMPACT PAVEMENT BASE, SAFETY SHOULDERS

The ability of Huber-Warco 3-wheel Rollers to serve as all-purpose compaction and finishing rollers was demonstrated on an eight-mile section of the Ohio Turnpike. Five 10-12-ton Huber-Warco rollers made short work of the many different jobs involved.

One of their first tasks was to compact a 9-inch course of loose material to form the base for the 10-inch concrete pavements, each lane 24 feet wide.

Then they were used to build up various courses of stone and bituminous oil to form the blacktop safety shoulders, finishing them by rolling a light course of No. 6 stone applied over Type Mc-5 asphalt.

Huber-Warco three-wheel rollers are available with standard cast iron rolls or fabricated steel variable-weight rolls in sizes from 5 to 14 tons for a wide variety of compacting and finishing requirements. Why not get complete details today from your nearest Huber-Warco Distributor.

HUBER-WARCO COMPANY

Road Machinery

Marion, Ohio

ROAD ROLLERS — MOTOR GRADERS — MAINTAINERS

NOTHING STOPS a mighty Manitowoc 4500!

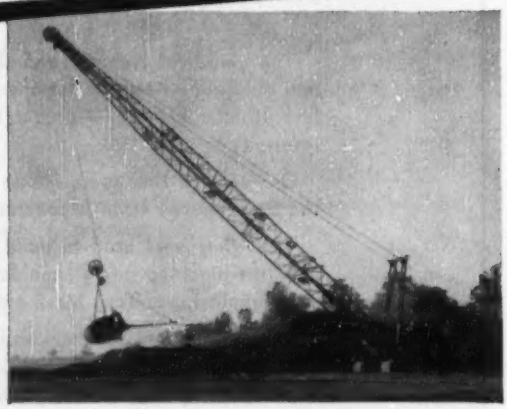
Not even this solid mass of rugged rock can stop a powerful Manitowoc 4500! Yard after yard — load after load — this mighty of the mightiest keeps right on smashing out a broad path for a railroad near Cheyenne, Wyoming.

It can't be beat as a shovel — handles up to 5½ yards of rock like a handful of peanuts. Single, free-turning tubular stick rolls through saddle and makes digging shocks harmless. Complete diesel operation permits traveling anywhere without a trailing cable or electric supply.

It can't be beat as a dragline — it's "steady as she goes", with a low center of gravity; wide, long crawlers — providing maximum stability for long reaching booms — features that mean full capacity buckets on every dragline job.

The 4500 main machinery is simple, powerful and fast, with only 15 gears and 8 sprockets — no lost motion — less maintenance and easy to service. All these advantages, plus the added power and performance of Manitowoc Torque Converter application.

See and get the facts on Manitowoc before you buy your next shovel or dragline.



4500 Dragline with 140′ boom and 5 yard bucket building levee near Chester, Illinois.

MANITOWOC

SHOVELS 1-5 YD. Speedcrane CRANES 18-100 TON

toll system for physical or financial reasons. Use of a few strategically placed barrier-type gates can produce a large income, while at the same time eliminating the capital investment and operating costs involved in building and operating toll gates at all entrance points. Also, such an arrangement adds to the usefulness of the highway by permitting access at many more points. It also permits much local use of the highway without payment of tolls, thus eliminating a major source of objection to completely closed toll roads on the part of residents of communities through which they are built.

This source of revenue could be used by the federal government to back bonds issued to finance a considerable part of the interstate system. In the interest of simplicity in financing and to speed construction of the interstate system, that method might be applied by the federal government wherever it appears practical. However, it appears more probable that Congress will undertake to encourage the states to do their own financing of all sections of the interstate system on which tolls could be obtained by use of either the open or closed system of toll collections. As noted previously, that could be done by capital grants to reduce the capital requirements of the state agency building a toll-project to a point where toll revenue could carry the interest and amortization charges on the agency's bonds.

Also, some form of credit could be granted to states that succeed in financing part of the work on the interstate system within their borders through private sources. Such credit, logically, should be retroactive for states that have built toll highways along routes that are part of the interstate net. This credit could be used to speed work on other parts of the federal-aid system.

• **Questions before Congress**—These are some of the financing questions that Congress will have to take up when it acts on the President's highway program. The sources of money for this great program are available. Automobiles and trucks, which have created our modern highway problem, will provide the income necessary to retire the needed capital investment through higher vehicle mileage, through payment of tolls on superior facilities and, if necessary, higher fuel taxes.

4. Is Our Roadbuilding Capacity Big Enough?

Assuming we can finance an enlarged highway program, the problem of actually realizing it turns the spotlight on the capacity of the construction industry to do the job. And it can be stated with considerable confidence that this capacity—in men, materials or machines—will be ample for any rate of increase in roadbuilding that appears possible.

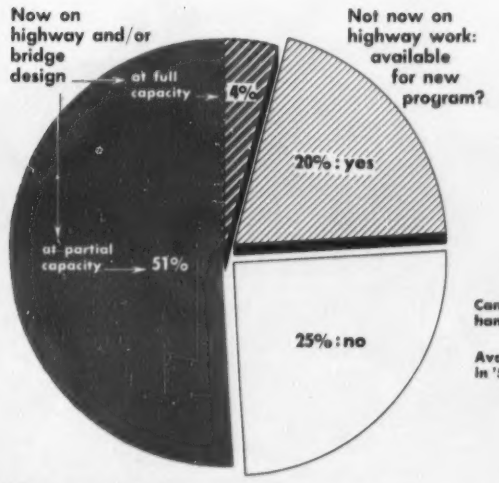
This is the conclusion from a series of surveys ENGINEERING NEWS-RECORD has just completed. In the unlikely event that the program should start off with as much as a $2-billion increase the first year there might be experienced: (1) a temporary shortage of capable design engineers in New England and parts of the Midwest, (2) an even briefer shortage across the nation of certain types of major highway building equipment, and (3) a temporary shortage of cement in New York, New England and parts of the Midwest.

But granted a reasonably short lead time, all elements of the construction industry could be ready to handle almost any size program. The surveys revealed only one area of possible difficulty—designers, especially design engineers with a lot of experience.

(*Continued on page 69*)

Consulting engineers† on highway design

75% of the 380 firms reporting are available for work on the proposed new highway program

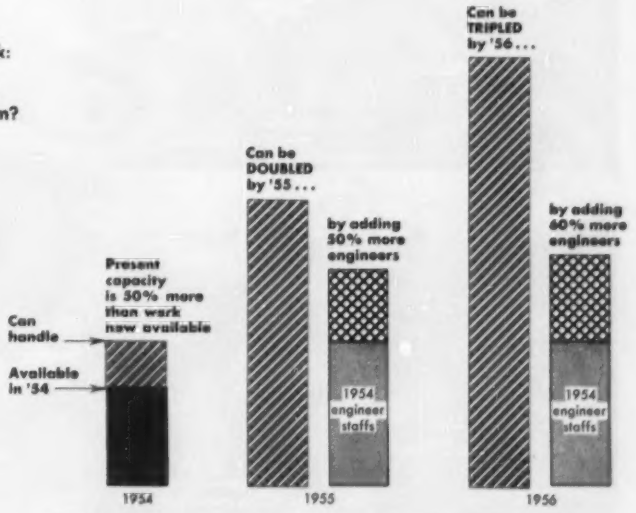


† Consulting and architectural engineering firms whose new projects started in 1953 totaled $100,000 or more in estimated cost. Sample responding to this study: 23%

Highway engineering capacity

Present capacity can handle 50% more work than was available in '54

Can be expanded to handle 3 times present volume in '55 and 4½ times as much in '56



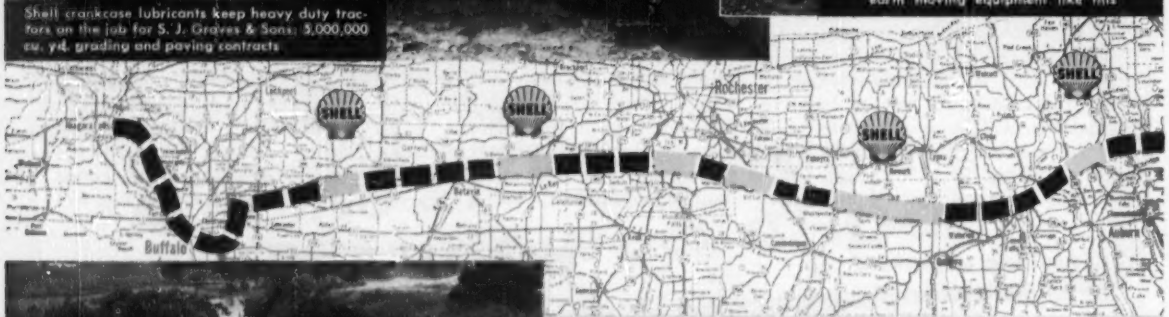
Based on median percentages reported by consulting engineer and architect-engineer firms doing highway and/or bridge design

© Engineering News-Record

On the New York State Thruway

Shell crankcase lubricants keep heavy duty tractors on the job for S. J. Groves & Sons: 5,000,000 cu. yd. grading and paving contracts

A single Shell grease normally lubricates all grease fittings on earth moving equipment like this



Severe operation causes no motor problem with Shell Heavy Duty oil in the crankcase

Shell E. P. Gear Lubricant takes the punishment during rough going on steep grades

Arute Bros., Inc. depend upon the "stay-put" qualities of Shell's Multi-Purpose Grease for continuous heavy duty work

. . . 1 out of every 3 construction miles uses SHELL PRODUCTS *exclusively*

That's just one way of saying that Shell has been awarded contracts by companies responsible for building sections of the New York State Thruway totaling over one third of the entire mileage. And the contracts are still coming in!

Trucks, shovels, dozers, graders . . . all equipment run by gasoline or diesel engines on those long stretches of highway construction . . . benefit from the outstanding performance of Shell heavy duty lubricants.

Products that can win the unqualified preference of such responsible and efficient operators must have what it takes . . . and Shell products *have* it . . . plenty!

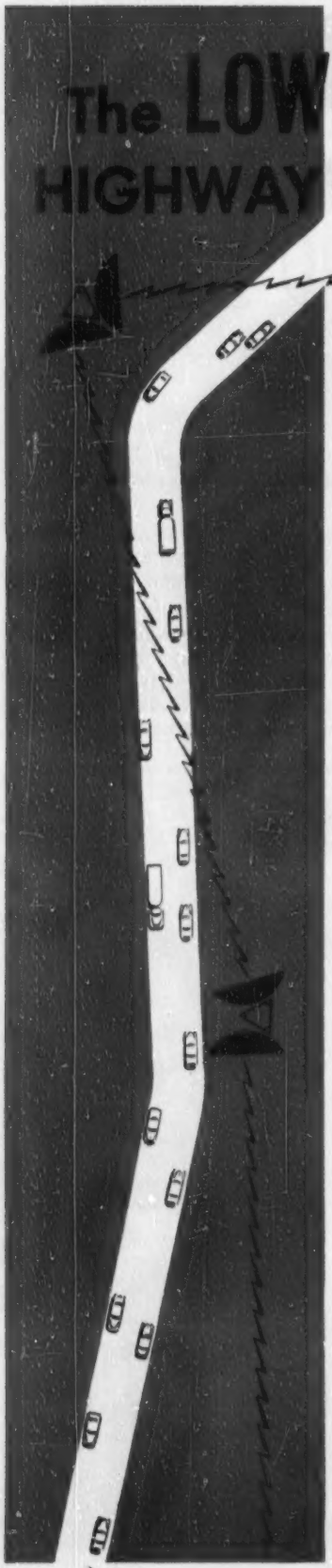
Most popular on the Thruway, and equally popular wherever heavy duty engines operate, Shell lubricants keep on protecting, defying wear, and keeping maintenance costs at rock bottom. Why not specify Shell for your equipment?

SHELL
Utica
Syracuse
Albany
Thruway Map © by General Drafting Co., Inc., Convent Station, N. J.
2½ cu. yd. Shovels thrive on Shell Heavy Duty Lubricants under extremes of load conditions

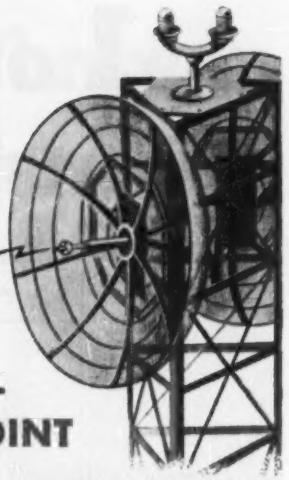
SHELL OIL COMPANY

SHELL

50 WEST 50TH STREET, NEW YORK 20, N. Y.
100 BUSH STREET, SAN FRANCISCO 6, CALIF.



The LOW-COST answer to HIGHWAY communications—



YOUR OWN SYSTEM of *Federal* POINT-to-POINT MICROWAVE

—spans swamps, rivers, bays, deserts and the highest mountains...without costly open wire or cable construction...gives you complete, private, all-weather communications...plus control of VHF mobile radio over the entire road system!

Dependable, around-the-clock communication facilities are a *must* for today's busy highways...for quick traffic control, policing, maintenance and administrative detail.

Federal Microwave – backed by 23 years of world-wide experience – is the system that meets *all* highway needs, and meets them at less cost per channel-mile.

Federal's system is *streamlined* microwave . . . *simpler* equipment requiring *fewer* tubes . . . simplest, smallest, highest-output RF equipment.

Federal means *economy*, because it is the *only* microwave system with *all* equipment made under *one* roof! Federal can supply transmitters, receivers, channel modulators and demodulators, trouble alarm equipment, dialing equipment,

switchboards and telephone sets.

Federal also supplies sub-channel equipment for telemetering, teletype or supervisory control...plus a complete line of VHF mobile radio equipment.

Federal Microwave eliminates "shopping" the equipment market ...assures uniform circuit quality... gives you *private, integrated* facilities...engineered by communication specialists. Over 6,000 route-miles installed in the U. S. are proof of Federal's *one-manufacturer* superiority.

No matter how lengthy or complex your highway system, Federal Microwave is the low-cost answer to your communication needs. Federal Microwave means a *"turn-key"* installation from *one* reliable source of supply!

HIGHWAY Commissions, Engineering Consultants and others interested in Highway Communications are invited to write for full information on Federal Microwave and a copy of *"Fundamentals of Microwave"*—a basic publication on the subject.

Address your inquiry to Dept. H-6115

Federal Telephone and Radio Company

A Division of INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

PTM AND WIRE TRANSMISSION SALES 100 KINGSLAND ROAD CLIFTON, N. J.

In Canada: Standard Telephones and Cables Mfg. Co. (Canada) Ltd., Montreal, P. Q.
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Consulting Engineer Design Capacity

How fast can it expand—how much more engineering staff will it require†

	Consultants can handle this much more work with present capacity		. . . and can expand their design capacity this much		. . . by hiring this much more engineering staff	
	Design	Construction supervision	By '55	By '56	By '55	By '56
All Firms	50%	50%	100%	200%	50%	60%
By size based on total estimated cost of jobs signed up in 1953						
$1,000,000 or more	50%	50%	100%	200%	50%	50%
$500,000-$1,000,000	40%	50%	100%	200%	45%	50%
$100,000-$500,000	50%	50%	100%	200%	50%	80%

†Median percentages reported by consulting engineer and architect-engineer firms doing highway and/or bridge design work

Will Engineer Shortage Develop?

	Percent of firms reporting . . .		How long does it take to train . . . Useful trainees Months			Qualified Engineers Years		
	. . . No	. . . Yes	Min.	Median	Max.	Min.	Median	Max.
All firms	58	42	1	6	60	½	4	10
By region								
Mid Atlantic	33	67	3	6	24	2	4	10
New England	62	38	1	6	60	1	4	8
South	56	44	2	6	30	½	3	10
Mid West	49	51	1	6	24	1	4	10
West of Miss.	65	35	1	6	24	1	5	10
Far West	68	32	3	6	24	1	3	7

Enough engineers?

Perhaps the greatest single problem inherent in an expanded highway program is design capacity—in state highway departments and in the offices of consulting engineers. Not many states yet contract design to consultants, but it must be assumed that the practice would have to be increased widely if a much enlarged highway program is undertaken. The ENR survey thus covered consultants as well as the state highway departments.

Right now, the consultants reported, they could handle 50% more design and supervision, and with a 60% increase in staff by 1956 they could double their present design capacity. How many engineers would have to be hired to effect this increase is not certain, but the states in their replies threw some light on this question. Thirty-six states would need 19,185 more engineers on their field and office staffs in order to handle double the work they are doing now. This would mean an average increase of 100% over present personnel in highway departments.

And it isn't likely that anything like that number of civil engineers will be available for an enlarged highway program. One need only look at the number of civil engineers who graduated from college last year—less than 5,000. And about half of those were snapped up immediately by the U.S. armed forces. Indications are that the number of graduates will pick up over the next three years to about 8,000 annually but even that won't solve the problem.

• **Substitutes needed**—Obviously, some means of substituting sub-professional, or non-engineering technical help for the younger engineers must be the answer.

Routine drafting, estimating and a large part of field work can be done by the sub-professionals to relieve young engineers—who too often find themselves saddled with these duties—for more professional work. Many consultants use sub-professional help at present. Useful sub-professional help can be trained in about six months; it can be drawn from high schools, technical junior colleges, or from college graduates in fields other than engineering.

Surveys also have shown that engineers can do an average of 50% extra work when aided by sub-professionals; some estimates of how much more work can be done run up to 500%. State highway departments reported that 20% of their engineers could be released for more professional work by the employment of sub-professionals.

But even here there's difficulty in finding enough sub-professional help. Two-thirds of the consultants contacted said that finding enough help in this category would be hard. The shortage probably would be most acute in New England.

• **Money talks**—The second solution to the engineer shortage isn't an easy one for the highway departments: money. Salaries must be attractive to graduating students and to engineers in other fields of construction, and, in fact, to induce beginning students to take up highway engineering courses.

A great many national associations such as AASHO, AGC, ASCE, ASEE and various state professional engineering societies have worked on programs for the improvement of education of young engineers and on their professional employment. Through these efforts the salaries of highway engineers in the next few years may be increased. But it is probably true that such increases in salary will be much easier to obtain in consultant firms, whose salary scales are much more sensitive to supply and demand, than are those of the state highway departments. A raise in general salary level of the highway departments is never an easy thing to sell budget-and-taxpayer-conscious politicians who know that every other public works department in the state then would demand commensurate raises for its personnel.

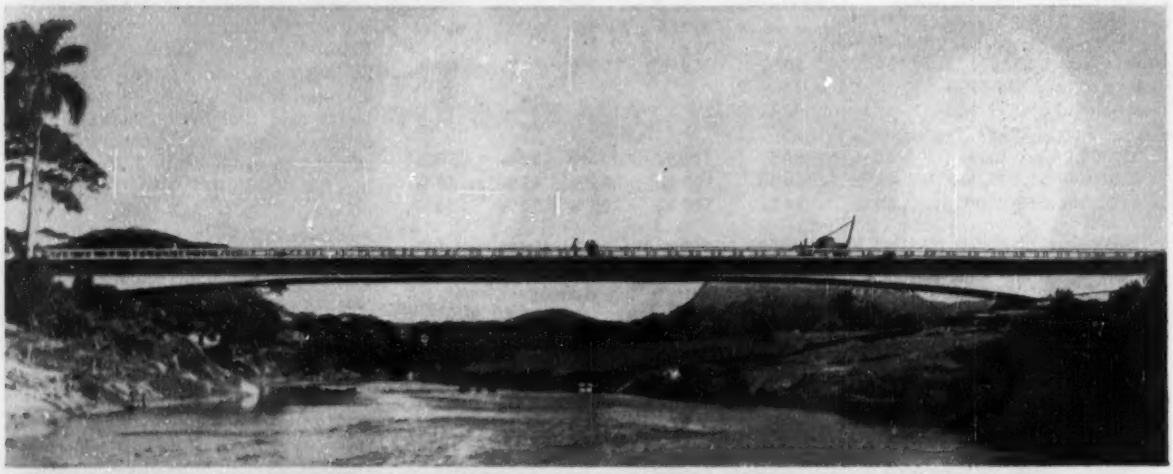
• **Other answers**—There are a number of other steps that may alleviate engineer shortages:

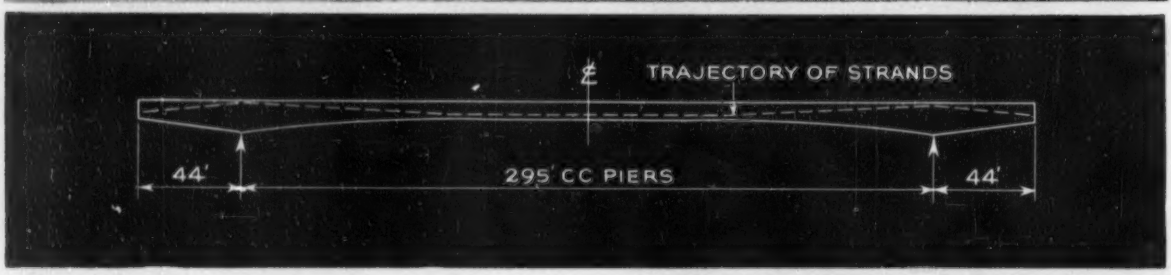
• New consultants can be attracted to the highway engineering field if there is enough incentive. Of those consultants answering ENR's survey, 20% not now doing highway or bridge work would like to get into the field. Of course there may be a small problem here too: The engineers who can serve as project managers appear to be at a premium. These men are experienced design and field engineers, and consultants report that the training of qualified engineers takes at least four years and that 10 years' experience is a better background.

• Photogrammetry, for making highway surveys, has many advantages. Some consultants report that they may

(Continued on page 74)

LONGEST PRESTRESSED CONCRETE SPAN IN WESTERN HEMISPHERE





CUYAGUATEJE RIVER BRIDGE is the fourth maintenance-free prestressed concrete bridge completed in Cuba in the last two years – and also the longest and most graceful. The twenty-eight 1-11/16-inch diameter galvanized Roebling Prestressed Concrete Strands which provide the main tensioning force were coated with bituminous paint after erection and are expected to last indefinitely in the dead air space of the span's hollow box. They are readily accessible for inspection, however, and could be replaced at any future time.

The use of these Roebling Strands in a hollow box assures uniform tension by eliminating nearly all friction during the tensioning process. This is especially important for long spans carrying heavy loads, and for continuous structures where reverse curvatures create high friction in other types of tensioning elements.

Roebling engineers, pioneers in the development of prestressing techniques and tensioning elements in America, are always ready to offer suggestions to help attain best results on any prestressed concrete application. Write Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

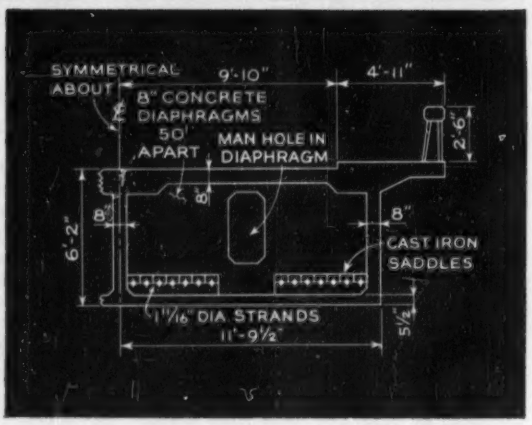


Photo: This graceful prestressed concrete hollow box spans the Cuyaguateje River near Pinar Del Rio. Main span, 295 feet center to center of piers; overall length, 383 feet; live load, AASHO-H20-44 . . . *Top blueprint:* Dotted line shows trajectory of the prestressing strands. *Lower blueprint:* Cross-section at center of main span including location of strands and manhole in diaphragm.

Bridge designed by Comision De Fomento Nacional De Cuba under supervision of Ing. Civil Luis Saenz, Designer and Chief Engineer; constructed by Compañía Constructora Munilla, Ing. Civil Fernando Munilla, Director.

ROEBLING

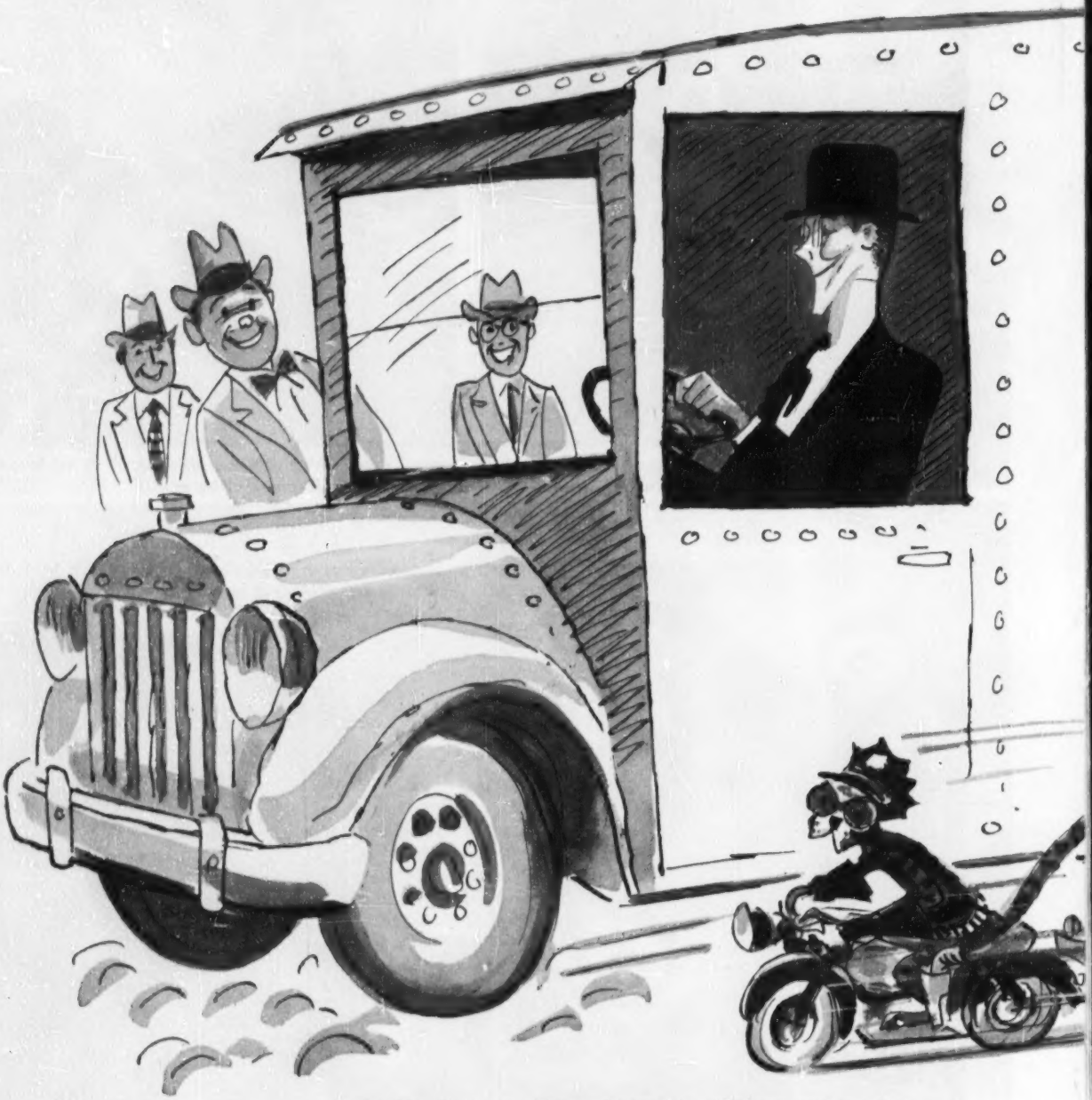
Subsidiary of The Colorado Fuel and Iron Corporation

Where the Highway Dollar Goes . . .

WIDENING adds precious capacity where it is needed, makes safer travel routes. West of Boise, Idaho, U. S. 30 was hemmed by roadside development (left). Four-lane improvement (right) benefits both travelers and abutting owners.

IT ISN'T CHEAP to widen a road in rugged country. Original New Jersey two-lane road (left) required minimum cut, but increase to four lanes called for a healthy slice off craggy promontory (below).

13 CONTRACTORS SAVE $601,890



MORAL: Preventing slips, mishaps and wrecks
Not only saves your workers' necks,
But lines your pockets blissfully
With crinkly wads of do-re-mi!

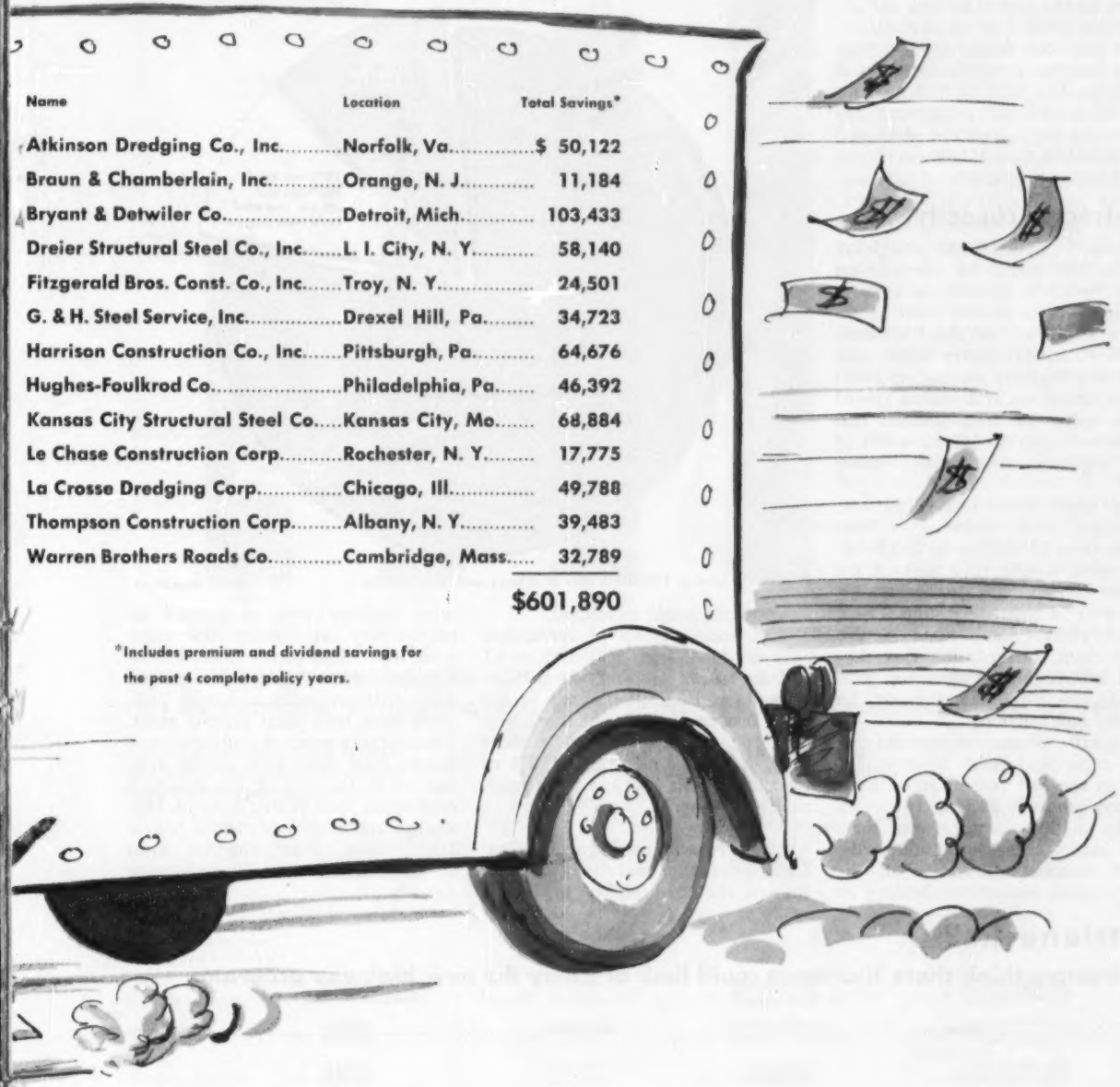
AMERICAN MUTUAL

Service from salaried representatives in 78 offices! *Savings from regular substantial dividends!*

) IN ONLY 4 YEARS! BY MR. FRIENDLY

Name	Location	Total Savings*
Atkinson Dredging Co., Inc.	Norfolk, Va.	$ 50,122
Braun & Chamberlain, Inc.	Orange, N. J.	11,184
Bryant & Detwiler Co.	Detroit, Mich.	103,433
Dreier Structural Steel Co., Inc.	L. I. City, N. Y.	58,140
Fitzgerald Bros. Const. Co., Inc.	Troy, N. Y.	24,501
G. & H. Steel Service, Inc.	Drexel Hill, Pa.	34,723
Harrison Construction Co., Inc.	Pittsburgh, Pa.	64,676
Hughes-Foulkrod Co.	Philadelphia, Pa.	46,392
Kansas City Structural Steel Co.	Kansas City, Mo.	68,884
Le Chase Construction Corp.	Rochester, N. Y.	17,775
La Crosse Dredging Corp.	Chicago, Ill.	49,788
Thompson Construction Corp.	Albany, N. Y.	39,483
Warren Brothers Roads Co.	Cambridge, Mass.	32,789
		$601,890

*Includes premium and dividend savings for the past 4 complete policy years.



Mr. Friendly has been known to remark that a column of figures can sometimes shed more light on the facts of life than the birds and the bees. The impressive column of figures on this page is eloquent evidence of what an integrated safety program can mean in premium and dividend savings. The thirteen distinguished engineering firms on Mr. Friendly's roll of honor know that American Mutual safety has three profitable by-products . . . humanity, efficiency and economy.

In case after case where American Mutual Safety Engineers have worked with contractors, they have been able to cut accidents and resulting losses far below occupational norms. If you are interested in a service that can help you keep accidents and injuries at an absolute minimum, send for free copy of "It Pays to Insure with American Mutual" with 6 actual case stories. Write: American Mutual Liability Insurance Company, Dept. O-132, 142 Berkeley Street, Boston 16, Mass.

©1954. AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

use as many men in a field survey as they use in the design office, if no photogrammetry is employed for the job.

• The final factor is the backlog of plans. There is no accurate picture of how far the present backlog of highway plans would help out in the shortage of engineers during the first years of the highway program. However, it will help. The value of work partially planned is estimated at between $10 billion and $15 billion and some part of it should be applicable under the enlarged highway program.

Contractor capacity

Almost $6 billion worth of highway construction could be carried out yearly by U. S. contractors without expanding their present plant at all. This was evident from the ENGINEERING NEWS-RECORD survey which indicated that highway contractors could expand operations at a median rate of 100%, using the same facilities that put in well over $3 billion worth of new highway construction during 1954.

The larger contractors—those who contracted for a volume of business greater than $1 million in 1953—feel they could handle their part of the greatest conceivable increase in highway work without expanding their present plant. Some firms in this group claim, furthermore, that they could achieve in the next few years virtually an unlimited capacity for highway construction.

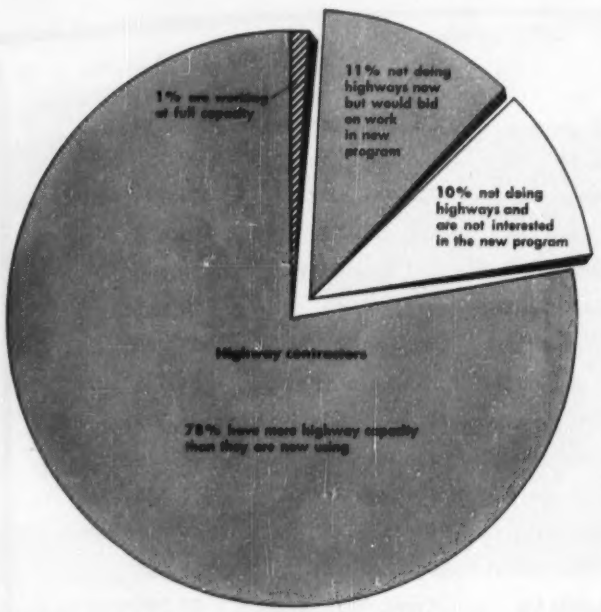
Generally, contractors reported that their capacities could be expanded 50% in the first year of an enlarged highway program, 80% in two years, and up to 100% in three years' time. That indicates that even under the fastest possible acceleration of the road program competitive bidding on all contracts would be assured.

The middle group of contractors —those doing from $500,000 to $1 million worth of work in 1953— showed up in ENR's survey as the firms that could carry out the largest proportionate expansion in a short time. A possible increase of 150% of capacity for this group in three years' time is indicated.

•**Eastern capacity needs growth**—Contractors in the mid-Atlantic states showed the least ability to handle more highway work at current capacity: they can handle 50% more work now. The survey showed New England contractors in a stronger position with an ability to handle 75% more work with their present plant. The southern group of contractors can handle 80% more work on the average, while the rest of the country's contractors, mid-West, West of Mississippi and Far West, could handle 100% more. New England firms showed the greatest ability to increase capacity.

1954 contractor capacity can handle a fast start in the new highway program

Of 950 contractors,* 90% are interested in the new highway program . . 78% are highway contractors with more highway capacity than they are now using


1% are working at full capacity
11% not doing highways now but would bid on work in new program
10% not doing highways and are not interested in the new program
Highway contractors
78% have more highway capacity than they are now using

*Firms which signed up $100,000 or more in '53 heavy construction contracts

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Bottlenecks?

Contractors think these shortages could limit or delay the new highway program

By region	Personnel: Experienced design engineers	Personnel: Qualified supervisory	Materials: Cement	Materials: Steel	Materials: Aggregates	Materials: Asphalt	Equipment: General
	% of contractors reporting						
All firms	49	37	39	12	9	2	3
New England	37	53	49	12	0	2	2
Middle Atlantic	34	34	60	16	14	2	4
South	61	38	23	15	10	2	2
Middle West	46	33	65	8	16	2	2
West of Mississippi	53	36	28	10	5	1	2
Far West	54	39	20	10	1	4	4

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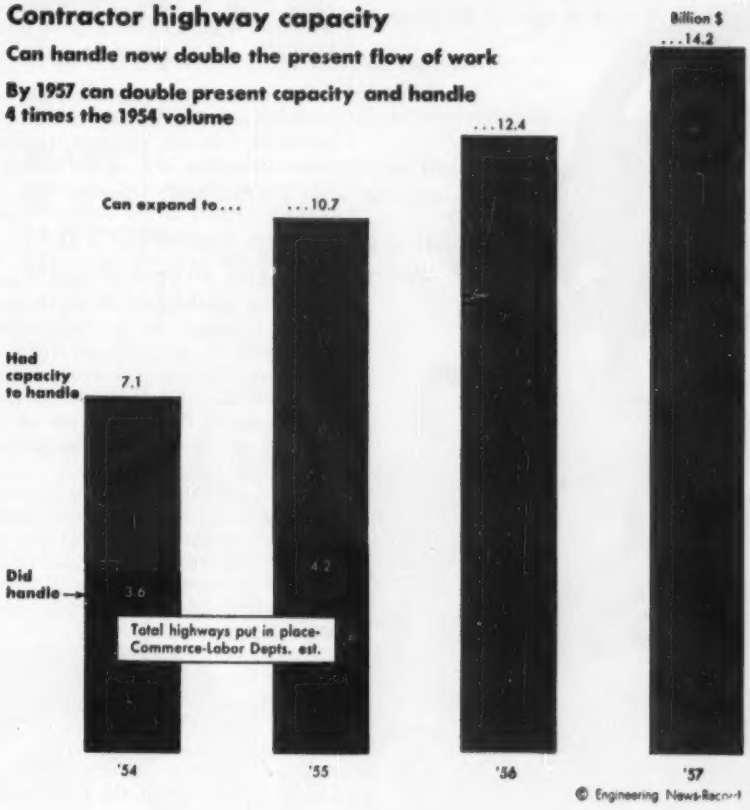
Contractor highway capacity

Can handle now double the present flow of work

By 1957 can double present capacity and handle 4 times the 1954 volume

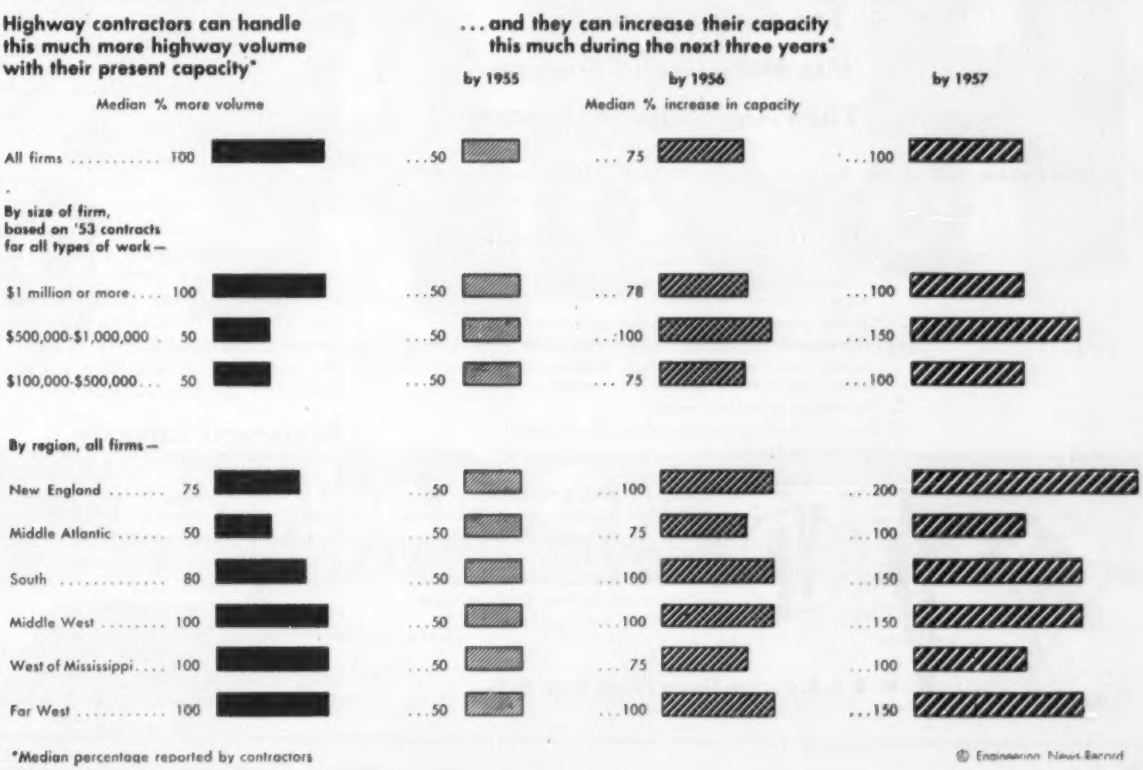


• **Competition the key**—The greatest indication of highway contractors' potential capacities lies in the great number of bidders in the highway field in recent years. An average of eight contractors submitted bids on every highway contract let around the country in the first three quarters of 1954. This stiff competition brought contract prices under estimates: winning bids averaged 11% below estimates. (Frequently over 20 contractors bid on a single job and the low bid was as much as 26% under estimates.)

Not only do these figures imply a great deal of contractor plant lying idle but ready to go to work, but they also indicate the great efficiency of that plant. It is also clear that the present contractor plant can do more work than the comparable plant of only a few years ago: the difference is in technological changes, such as rubber-tired equipment, torque converters, high strength steels, etc.

The great number of bids made on highway projects in 1954 was not unexpected, for the number of bidders on highway work has increased steadily since 1951. But contractors not now doing highway work have also shown a great deal of interest in the highway field. Firms that now handle only bridge, dam, port and airport work could all, presumably, change their

How 1954 highway capacity compares with volume of work and how capacity can be increased during the next three years—by size of contractor and by region


Highway contractors can handle this much more highway volume with their present capacity*
Median % more volume
...and they can increase their capacity this much during the next three years*
by 1955
by 1956
by 1957
Median % increase in capacity
All firms ..... 100 ...50 ... 75 ...100
By size of firm, based on '53 contracts for all types of work—
$1 million or more.... 100 ...50 ... 78 ...100
$500,000-$1,000,000 . 50 ...50 ...100 ...150
$100,000-$500,000... 50 ...50 ... 75 ...100
By region, all firms—
New England ..... 75 ...50 ...100 ...200
Middle Atlantic ..... 50 ...50 ... 75 ...100
South ..... 80 ...50 ...100 ...150
Middle West ..... 100 ...50 ...100 ...150
West of Mississippi.... 100 ...50 ... 75 ...100
Far West ..... 100 ...50 ...100 ...150

*Median percentage reported by contractors

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The Gurley Transit
Has More Useful Features
Than Any Other Instrument

Check these features:
- ○ *As much as 25% lighter than other makes*
- ○ *Made of aluminum alloys, 30% stronger than metals usually used*
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- ○ *Agate bearings and leaf-type tangent springs give smoothest possible motion on tangent screws*
- ○ *Reversion telescope level*
- ○ *Most accurately graduated circles of any instrument today*

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Variable Power, now standard on all Gurley transits and levels, permits wide range of magnification with *one* eyepiece. Change your magnification to suit weather and light conditions. Built-in haze filter. *Write for "Facts on VP."*

W. & L. E. Gurley, Union Plaza, Troy, N.Y.

plant setup to handle highway construction, if such a change could prove profitable.

• **Contractors lack engineers**—The capacity of contractors depends on the supply of materials, equipment, supervisors, operators, and capital among a lot of other things—but the supply of engineers looms as the only real roadblock (see also page 69).

Of all the contractors surveyed by ENGINEERING NEWS-RECORD, half cited the availability of experienced design engineers as the most likely bottleneck in an enlarged highway program. This was less true for contractors in New England and the mid-Atlantic States than in the rest of the country; southern states seem to have the greatest shortage.

About a third of the firms surveyed felt that a shortage of qualified supervisory personnel might also be an impediment to the rapid implementation of such a program. New England firms believe this shortage to be more acute than any other.

• **Labor force adequate**—Federal statistics on the availability of labor indicate that no labor problem will be encountered in the highway program. For each additional $1 billion worth of highway construction, the U.S. would need about 120,000 more men in the "on site" construction labor force. Under a highway program that could reach an $11 billion yearly volume, the U.S. might need almost 1,000,000 more on site construction workers.

The nation now has a labor pool of about 63,000,000, so that such a proportionately small expansion in labor force should be easily absorbed. A great deal of the industrial labor force—and that in other fields of construction—is highly mobile and could easily move into highway construction.

The only possible labor shortage might be in equipment operators during the first few years of a rapidly accelerated highway program. However, since the build-up to full volume of construction is likely to be gradual, the additional skilled labor could be trained as the program grows.

Equipment capacity

The construction machinery industry is now working at only partial capacity, could increase its manufacturing rate as much as 50% in a matter of months, and, by modestly paced expansion, could keep up with any foreseeable volume of highway construction, no matter how big.

The only circumstance that might bring temporary shortages in certain types of equipment would be if the

(Continued on page 80)

PATCH roads, streets, and runways the most economical way.

PATCH with permanent hot mix.

PATCH in all seasons with dried, heated aggregate.

PATCH with the machine that produces **all** mixes (including low slump concrete).

PATCH with the mixes produced on the job site or in a convenient central location.

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descriptive literature . . . sound movies

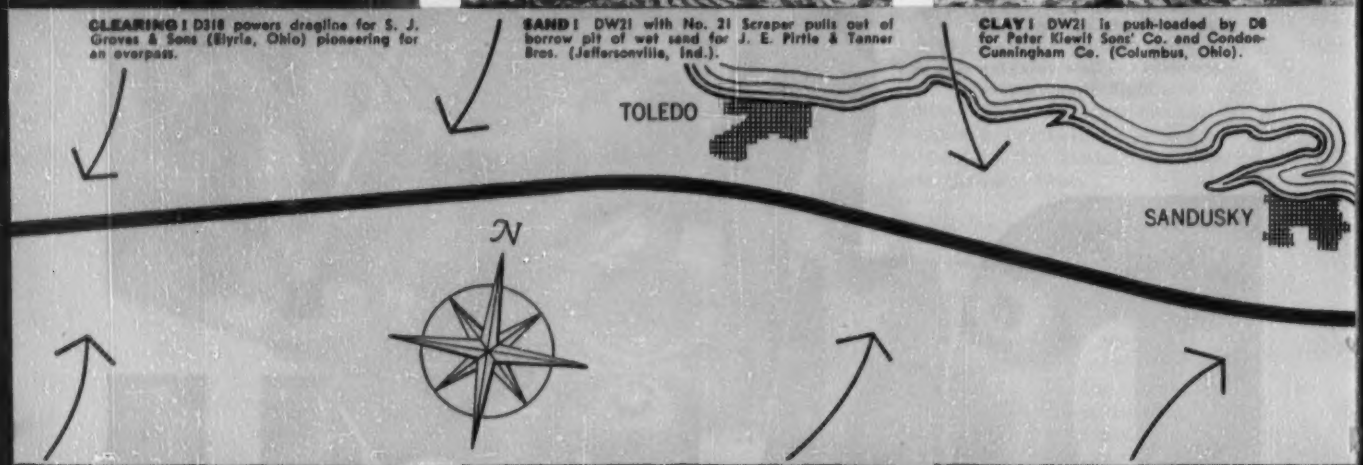
cost studies . . . nearby job inspection . . . plant layouts

Across the board ...the choice is

CLEARING! D318 powers dragline for S. J. Groves & Sons (Elyria, Ohio) pioneering for an overpass.

SAND! DW21 with No. 21 Scraper pulls out of borrow pit of wet sand for J. E. Pirtle & Tanner Bros. (Jeffersonville, Ind.).

CLAY! DW21 is push-loaded by D8 for Peter Kiewit Sons' Co. and Condon-Cunningham Co. (Columbus, Ohio).



MUD! D8 equipped with No. 8A Bulldozer working in clay at overpass for V. N. Holderman & Sons (Columbus, Ohio).

DRAINAGE! D8 with No. 80 Scraper maintains ditch alongside fill on Winston Bros. Co. (Minneapolis) contract.

HAUL ROADS! No. 12 Motor Grader maintains road for Holloway & Thompson Construction Co. (Livonia, Mich.).

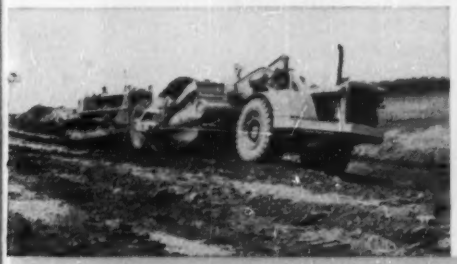
Over 50 contractors are pushing the nation's newest turnpike to completion through sand, bog, clay and rock. As one man, they've turned to big yellow equipment. Eighty-five per cent of their crawlers, 83% of their motor graders are Caterpillar—over 650 pieces of earthmoving equipment in all!

The roster of contractors at work on the Ohio Turnpike reads like a blue book of America's road builders. And from one end of this $326 million road to the other, they have given Caterpillar the biggest vote of confidence in road building history.

Collectively they have more than 650 pieces of Caterpillar-built earthmoving equipment on the job—and that doesn't include scores of CAT® Diesel Engines and Electric Sets. *They have far more Caterpillar equipment at work than all the other makes put together!*

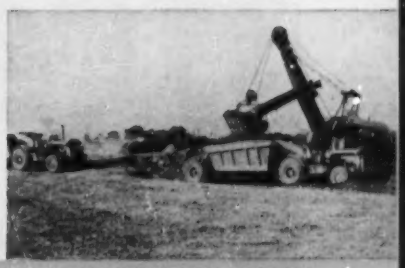
Yet there is no pattern in the type of work being done by this tremendous fleet of Caterpillar equipment. For on its 241 miles, the Ohio Turnpike presents every possible type of terrain and soil—from river bottom to mountains, from quicksand and bog to clay and rock.

on the Ohio Turnpike Caterpillar



QUICKSAND! D8 push-loads DW21 and No. 21 Scraper in quicksand over blue shale for Ralph Myers Contracting Corp. (Salem, Ind.).

ROCK! D8s in tandem push-load DW21 and No. 21 Scraper in rocky soil for R. B. Potashnick (Cape Girardeau, Mo.).



LONG HAULS! DW20 with W20 Wagon carries shale and rock on a *four-mile haul* for Frank Mashuda Co. (Milwaukee).

HIGH-SPEED HAULING! The first DW21 ever built still does high-speed hauling for Nick Cenci & Sons (Columbus, Ohio).

CRUSHING! D8 loads portable gravel plant powered by D337 for W. J. Menefee Construction Co. (Sedalia, Mo.).

GUMBO! No. 90 Scraper, pulled and push-loaded by D8s, works in gumbo for Harrison Construction Co. (Pittsburgh).

It is an amazing demonstration of the versatility of big yellow equipment. There are 450 Cat track-type Tractors alone — *346 are D8s!* That represents 85% of all the crawlers at work on the project. Eighty-three per cent of the motor graders at work are Caterpillar, and 60% of the rubber-tired tractor-scraper units.

Heavy-duty, dependable Cat Diesel Engines are powering draglines, clamshells, shovels, backhoes, crushers, compressors, loaders. And through long, dark second shifts, Caterpillar Electric Sets are producing the electricity for flood-lighting and contractors' service shops.

Never before has there been such a testimonial to one make of equipment as this 650-unit fleet. Now's the time to follow the lead of road building leaders.

Start standardizing on Caterpillar equipment!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Lenker L-E-Vation Rod eliminates all calculations . . . a direct reading level rod for Engineers, Contractors, Builders . . . incorporates all the uses for which an ordinary level rod is adaptable. Simple and easy to operate, it is widely used.

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yearly increase in dollar volume of highway work during the first years of the program were to be on the order of $2 billion. Such a rapid acceleration is not likely to happen under present plans. But if it did, and the capacity of the manufacturers remained at present levels, there might be shortages in the following types of equipment: wheeled tractors, off-highway trailers and wagons, concrete batch plants, concrete spreaders and finishers, concrete pavers, asphalt plants, bituminous pavers, and crushing and screening plants.

In the matter of a rapid increase in dollar volume of work put in place, there is one serious factor: that of "bunching" work put in place in any one year. Plans, financing, right-of-way acquisition, etc., all take time—sometimes as much as four and five years—before actual construction operations are started on a road job. This situation frequently leads to a volume of work put in place far in excess of the amount which might have been predicted for any one year.

Under an enlarged highway program, it is entirely possible that the first three years would see comparatively little added highway construction, and then that the fourth and fifth years would have record volumes perhaps in the neighborhood of $11 billion. Such a situation, if there had been no big increase in usual volume the previous year, might create shortages in equipment and cement shortages (see table page 87).

• **Shortages temporary**—But these shortages would exist only until the peak construction volume had been reached and passed. After that, equipment manufacturers would be called on only for replacements of old equipment—the total contractor plant having been built up to full operating strength. Such replacements would be little more than those required currently by highway contractors.

That the equipment industry is well able to handle much more business right now was reflected in a report made last month by the Construction Industry Manufacturers Assn. to the American Road Builders Assn. for the Clay committee. Member companies of CIMA operated at only 33% to 67% capacity during 1954.

• **Roads take 30% of plant**—Highway construction and maintenance work at the present time accounts, on an overall average, for about 30% of all equipment in the construction field—some types having a higher usage, some a lower. It has sometimes been asserted that more than 30% might be available for highway construction, but this is very doubtful. Nor is it apt to be true in the future.

Equipment Required for Each Added Billion Of Highway Construction

Equipment Type	Number of units*
Asphalt Plants	250
Bituminous Distributors	250
Bituminous Pavers, Spreaders & Finishers	400
Compressors	
Portable, Air	2,250
Concrete	
Batching Plants	100
Mixers, Portable	1,500
Spreaders	100
Finishers	100
Pavers	200
Truck Mixers & Agitator	1,000
Crushing & Screening Plants	250
Haul Units	
Trailers & Wagons	1,000
Self-Loading Scrapers	2,400
Trucks (Off-Highway)	450
Dump Bodies & Hoists	2,000
Loaders, Front End	1,000
Mixers	
Soil Stab. & Bitum.	200
Motor Graders	1,500
Power Cranes & Shovels	3,000
Pumps, Portable	2,400
Rollers	
Road, Tamping, Pneumatic	2,000
Tractors	
Crawler	3,000
Wheel-Type	2,000
Attachments	
Crane & Loader	200
Dozers, Bull & Angle	1,500
Power Control Units	3,700
Trenchers & Ditchers	250
Miscellaneous Units	3,000
Totals	36,000

Based on surveys by ARBA
* Estimated at prevailing work schedules

Estimates are that in ten years the total volume of construction in the U. S. will be around $55 billion yearly, an increase of about $20 billion over the present volume. At an $8 billion yearly highway construction volume, the proportion of highway work to total construction—ten years hence—will be only slightly larger than it is now. This means that the diversion of construction equipment from other fields into highway work will not be very significant. Total equipment units can be expected to keep pace in growth with the total construction.

• **The manufacturing picture**—What then is the total equipment situation? It is the answer to this question that is significant because manufacturers must supply all segments of construction and not only roadbuilding.

(*Continued on page 82*)

The pleasantly shaded mall, flanked by modern shops, adds charm to the Cross County Center's basically functional design. Towering in the background is the 1500-ton Bethlehem steel framework of the new Gimbel Brothers branch department store.

ANOTHER SUBURBAN SHOPPING CENTER TAKES SHAPE

One of the more spectacular indications of the current movement of population away from congested cities has been the phenomenal growth of suburban shopping centers. An estimated 2000 such developments, large and small, are now in the planning or construction stages, or have been recently completed.

Among the largest is the $30,000,000 Cross County Center at Yonkers, N. Y., at the southern tip of prosperous Westchester County. This 70-acre project, developed by Sol G. Atlas and designed by Lathrop Douglass, boasts branches of two famous department stores—John Wanamaker and Gimbel Brothers. These and other features are expected to attract shoppers from the Bronx and upper Manhattan, as well as from the surrounding suburban areas.

Many of the Center's stores are situated on the 1000-ft-long landscaped mall. At either end of the mall stand the department stores, Wanamaker's to the east, Gimbel's to the west. Ultra-modern in every respect, the stores are constructed on steel frames totalling over 3000 tons, fabricated and erected by Bethlehem.

Among the varied features of the mammoth project are two banks, a 125-bed hospital, restaurants, an auditorium, a huge supermarket and parking fields accommodating 5140 cars.

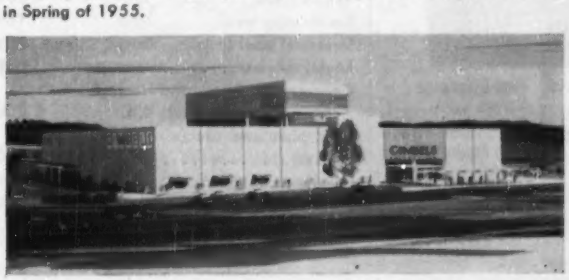
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

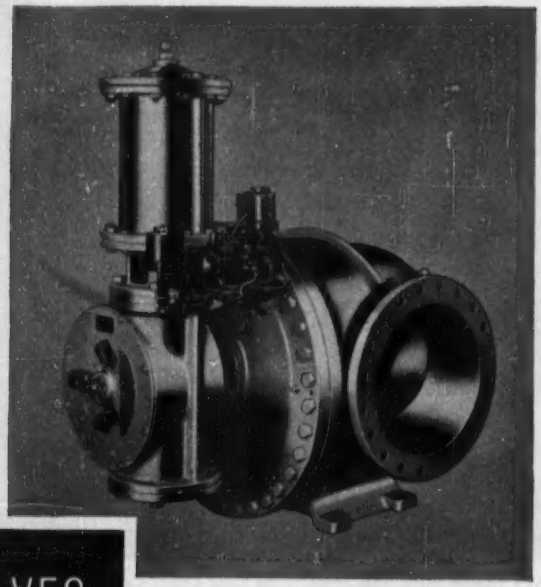
BETHLEHEM STEEL

BETHLEHEM STEEL

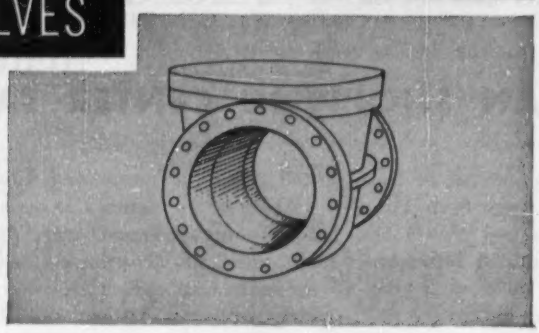
Architect's drawing of the Gimbel Brothers branch department store. The two-story-and-basement, 250,000-sq-ft building will be ready for business in Spring of 1955.



Planning a grand opening in late Fall of '54, Wanamaker's will provide "split-level" parking, with lots at various levels for stair-free access to all three shopping floors.



SMS
ROTOVALVES



LESS HEAD LOSS MEANS LOWER PUMPING COSTS

Free, unobstructed flow through SMS-Rotovalves means a lower head or pressure loss, helps you keep pumping costs down. The full line opening shown in the drawing above offers no more resistance than a straight piece of pipe of the same diameter.

Rotovalve design solves many control problems. The conical plug first lifts, then rotates and finally reseats. You get easy operation, precise aperture control, controlled closing time, tight and positive closing, easy mechanical cleaning, low maintenance, long life.

These high-performance characteristics are the result of over 75 years of engineering and research experience in the hydraulics field. For detailed information on Rotovalves, contact our local representative or write to the S. Morgan Smith Company, York, Pennsylvania.

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SMS
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According to estimates, all U.S. contractors now own about $10 billion worth of equipment of which about $4 billion represents over-the-road trucks and $6 billion construction machines of all kind. About $1 billion worth of these units is retired each year for reasons of wear and obsolescence.

The U. S. construction equipment industry, even at partial capacity, accounts for a yearly production valued from $1¼ to $1½ billion, plus a large volume of repair parts which can be expected to grow rapidly. According to informed sources, the expansion capacity of the industry is such that, if necessary, some $2 billion worth of equipment could be turned out yearly without any need for expanding present facilities.

How far would such an increase in output go toward meeting the requirements of the road program? The number of construction machines of various types for $1 billion additional road construction (exclusive of right-of-way and engineering) has been authoritatively estimated, as shown in the accompanying table. If these units are multiplied by their respective replacement values, a total of about $350 million is obtained. If to this figure is added the value of over-the-road trucks (not included in the table), which is estimated at about $150 million, the total equipment cost per $1 billion of new construction contracts is seen to be about $500 million.

Should the volume of new highway construction increase as fast as $2 billion each year, $1 billion of new construction equipment may be needed soon, over and above replacements.

The total amount of equipment needed could be more than the industry's stated capability of a $2-billion output yearly, so that some increase in

Material Quantities per Billion Dollars of Programmed Highway Work

Materials	Unit	(000's)
Cement	bbls.	11,600
Aggregates	cu. yd.	75,400
Bitumens	gal.	290,000
Lumber	mbm.	98
Wood piles	l. f.	3,200
Reinforcing steel	tons	183
Structural steel (total)	tons	201
Metal culverts	tons	38
Concrete culvert and drain pipe (all sizes)	l. f.	5,200
Clay pipe and tile (all sizes)	l. f.	2,020
Petroleum products	gal.	170,000
Explosives	lbs.	23,200

Based on Federal Aid System needs.

Photographs taken on the job in Long Island, N. Y.

Here's what they say about the new MICHIGAN® 3/4 YARD

Contractor: Hendrickson Bros., Inc., General Contractors
Valley Stream, New York

Job: Excavation and pipe laying for Southern State Parkway, Long Island

MASTER MECHANIC:
"We tried out the new T-24 for a week; and, because it did such a good job in that short time, we bought it."

OPERATOR:
"It's got delicate control and positive action. I can put the bucket down just where I want it, pick up a cable or wooden stake and not even disturb the dirt. It's a fast machine."

OILER:
"This Michigan is an oiler's dream. The liberal use of ball bearings on shafts, drums and rollers means less wear and much less oiling. All we do is oil our T-24 once a week."

There's little to add to these Hendrickson statements—except to emphasize that you, too, will move bigger yardage faster and at less cost with a MICHIGAN Series "24" ¾-yard excavator-crane. Best way to prove it is to do as Hendrickson did . . . TRY IT! Send for the booklet "Bigger Yardage Through Air Power"; and for detailed specifications.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Div.
390 Second Street
Benton Harbor, Michigan 24

Please send the booklet "Bigger Yardage Through Air Power" and specifications of MICHIGAN Series "24".

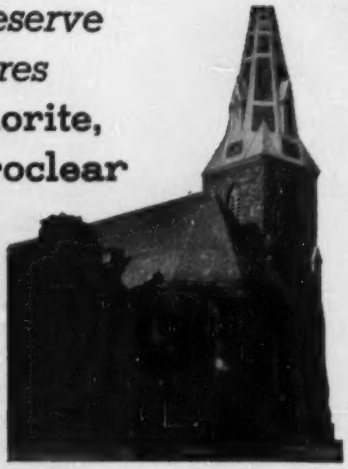
Name_____

Firm_____

Address_____

City_____

How to restore and preserve costly masonry structures with **D-J Mortar, Thorite, Thoroseal and Thoroclear** *even though masonry looks beyond repair!*



Second Episcopal Church of Boston, Brookline, Mass.

Only the bare skeleton of cornice remains after years of disintegration.

To repair, all loose material was cut out and complete surface was wire brushed in preparation of THORITE treatment.

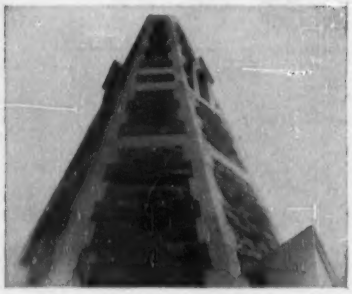
Above photos show how vines grew over stone structure and hid most of damaged masonry.

Vines were cut away from building and disintegrated joints grouted with D-J Grouting Mortar.

Stone trim was then given two coats of THOROSEAL. Entire surface received a coat of transparent THOROCLEAR.

AFTER Brush and trowel coat of THORITE, nonshrink patching mortar was used to restore this masonry to its original lines. A two-coat application of THOROSEAL was applied to beautify and protect the surface. Nonsagging THORITE can be used to model any masonry structure back to its original lines.

ALL MASONRY NEEDS PROTECTION



Stretcher stone work treated with D-J Grouting Mortar and entire stone surface THOROCLEARED.

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"HOW TO DO IT"

Standard Dry Wall Products, Inc.

NEW EAGLE, PENNSYLVANIA, U.S.A.

manufacturing capacity might be required to service the enlarged road-building program.

Such an increase however, should not be hard for the industry to carry out. And as the supply of equipment in contractors' hands increased, new equipment requirements would decrease, since the equipment produced in any one year is good for 7 to 10 years of use. It can only be concluded that equipment will at all times be in ample supply to meet any road construction needs.

Materials supplies

On the basis of announced expansion plans of various segments of the construction materials producing industry, there appears to be no prospect of shortages of materials for the enlarged highway program.

Provided that the acceleration of the program is gradual—that a build-up to an $8 billion level requires at least five years from the present—no shortage of materials will hamper construction schedules.

The key items in the materials field are cement, steel and asphalt.

You can eliminate asphalt as a problem right away. Asphalt production can be increased almost at will, simply by altering refinery cracking processes of particular types of crude oil to render more asphaltic by-products.

But under a rapid acceleration of the highway program, cement and wide-flange steel beams might be in short supply in the first few years, though the availability of these materials over the next decade would average out. Expansions of production capacity for both items have been announced this year, and future production should take care of not only an enlarged highway program, but also the rapidly expanding activity of the whole construction industry.

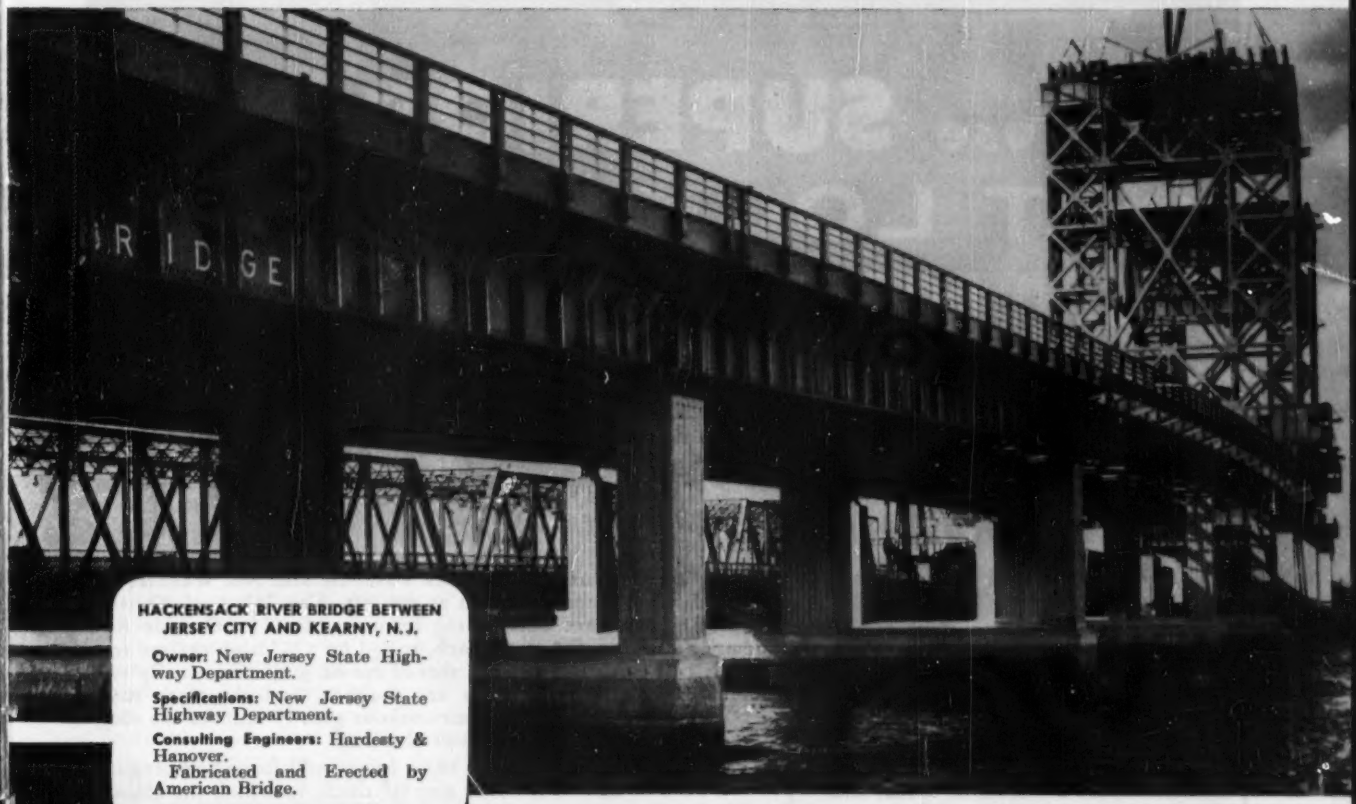
Cement

Although there will be regional shortages, total cement production in the U.S. should be ample to meet an enlarged highway program, according to the industry's announcements of plans for plant capacity expansion. Around a dozen companies have already made such announcements.

Current production in the U.S. runs around 265,000,000 bbl a year, with capacity of 291,000,000 bbl.

Highway construction uses 45,000,000 bbl yearly at present rates. But at an $8 billion yearly volume, almost 100,000,000 bbl would be needed. In 1959, therefore, there might be a demand for 320,000,000 bbl of cement, not including the demands from inevitable growth in other fields of con-

AMERICAN BRIDGE spans the Hackensack again!



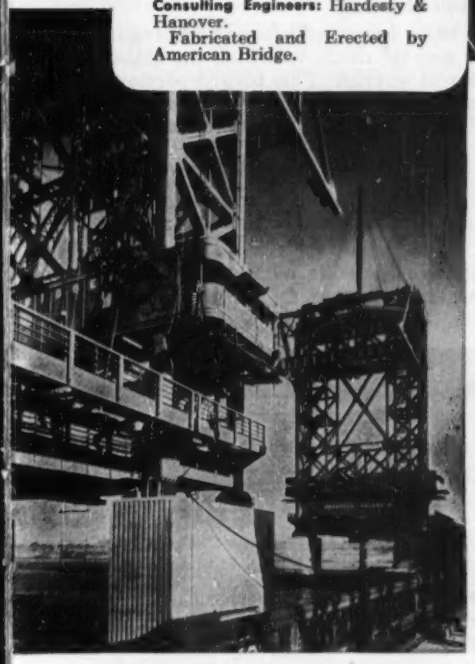
HACKENSACK RIVER BRIDGE BETWEEN JERSEY CITY AND KEARNY, N. J.

Owner: New Jersey State Highway Department.

Specifications: New Jersey State Highway Department.

Consulting Engineers: Hardesty & Hanover.

Fabricated and Erected by American Bridge.



Providing broader roadways and wider channel, new structure on U.S. Routes 1 and 9 between Jersey City and Kearny speeds highway and river traffic!

SPANNING the Hackensack is getting to be a habit with American Bridge. We've done it twice in less than two years. Completing in 1952 a 5613-ft. structure with a 375 ft. plate girder main span on the N. J. Turnpike near Laurel Hill, N. J.; and this year, building a new bridge over the same river on heavily travelled U. S. Routes 1 and 9 between Jersey City and Kearny for the New Jersey State Highway Department.

Replacing a lighter, narrower bascule bridge, the new wider, higher Hackensack River Bridge is an important contribution to both highway and river traffic in this busy industrialized area. The new bridge increases the channel width and shortens operating time and traffic delays.

Carrying two 36-foot roadways, a 4-foot center mall, and two 6-foot sidewalks, this 1,480-ft. bridge is dominated by a 222-ft. thru truss lift span that is supported by towers 149′ high and 81′4″ wide. Seven thousand tons of structural steel were used in the bridge, all of which was fabricated and erected by American Bridge.

These Hackensack bridges are recent examples of American Bridge engineering, fabricating and erecting "know-how." If you would like to know more about the advantages of American Bridge construction, contact our nearest office.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY MEMPHIS • MINNEAPOLIS • NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

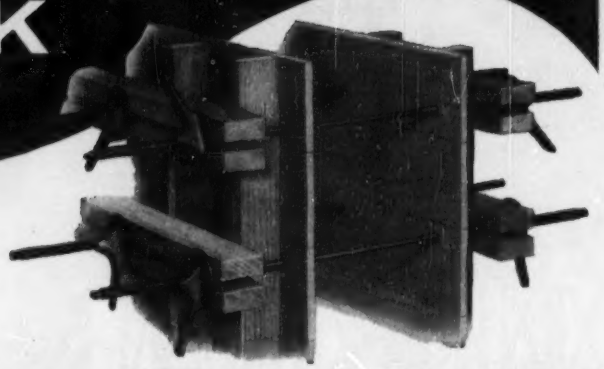
AMERICAN BRIDGE

USS

UNITED STATES STEEL

When job conditions call for this type of Heavy-Duty Tie . . .

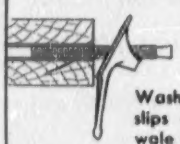
use SUPERIOR TILT LOCK CLAMPS



with SPECIAL Safety-Type Handle and Nut Washers

HANDLE WASHER — NUT WASHER

The malleable Handle Washer combines handle, washer and wrench—Designed for absolute safety; cannot fall off threads when load drops off or when handle is hit accidentally. The cast iron Nut Washer has all the features of Handle Washer except the open slot for use as wrench.



Washer, in tilted position quickly slips over stud rod threads to wale and is seated.

Three full turns on the threads of the outside rod bring it flush and tight against the wale. When pointing upward, the handle may be hit accidentally or pressure released during pouring. This may cause the handle to turn 180°, but the safety feature of 3 complete turns makes it impossible for the clamp to fall off the thread.

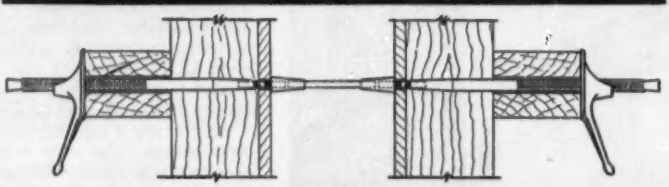
The "safety in use" of Superior's Handle and Nut Washers for Tilt Lock Clamps is shown at the left. The Tilt Lock Outside (Stud) Rods have outstanding features, too. The Outside Rod has ⅞" threads, five to the inch, rolled on a ¾" high carbon rod. This compares with the ¾" thread cut on a ¾" rod usually supplied. Cold rolled threads are tougher, and therefore more resistant to damage, and their contour greatly reduces the clogging of concrete and facilitates cleaning.

The Tilt Lock Outside Rod has a heavy cold forged rectangular end section that is ¾" wide and ½" thick, to which the Handle Washer is applied as a removal wrench. This forged section is practically indestructible, never becomes rounded after numerable reuses as does a milled end. Therefore, it is never necessary to use a Stillson.

Superior Tilt Lock Clamps are supplied with Outside Rods 16" long and 20" long, for both ⅜" and ½" inside tie rods. Extensions are available where field conditions require Outside Rods longer than 20".

Superior supplies high tensile inside rods with rolled threads. Form layouts and estimates are prepared from plans without charge or obligation.

with Cone Nuts for Spreader Action



Where it is desirable to use Tilt Locks with Superior Cone Nuts for spreader action or other reasons, Tilt Lock Rods are adapted for use with Cone Nuts as illustrated above.

Tilt Lock Clamp Assemblies may be rented with a ninety day option to purchase.

SUPERIOR CONCRETE ACCESSORIES, INC.

4110 Wrightwood Avenue, Chicago 39, Illinois

New York Office
1775 Broadway, New York 19, N. Y.

Pacific Coast Plant
2100 Williams St., San Leandro, Calif.

struction. (In the event of an $11 billion program there might be a total demand for 380,000,000 bbl of cement.) According to the Bureau of Mines, however, the expected annual production of cement in 1959 is 407,000,000 bbl, a quantity which should easily supply both highway and other construction growth.

• **Regional cement pinch**—There are nevertheless two areas of the U.S. where the shortage of cement might be felt acutely during the first few years of the expanded program: New York and New England, and the five-state group—Wisconsin, Michigan, Illinois, Indiana, and Kentucky. According to Bureau of Mines and ARBA figures, a greatly enlarged highway program in these areas would consume enough of current production capacity to curtail greatly all other construction activity. But in light of the planned expansion throughout the whole cement industry, the squeeze on cement in these areas would be greatly alleviated five years after inception of the program.

Regional shortages of cement, or marketing area shortages (indicated in a few places at great distances from cement production centers), could be handled by inter-regional shipments. Also the Clay Committee has envisioned scheduling plans for the Interstate Road system to prevent short supplies as much as possible.

If, for example, cement was in very short supply in New England in the early spring, a large part of interstate work in that region might be scheduled in the fall. State and city highway work cannot be so easily scheduled, but might be automatically slowed by higher prices during periods of shortage.

• **Planned expansion is huge**—Expansion of the cement industry in the next two years, according to the Bureau of Mines, will increase capacity by 15%. And by 1959 the increase in capacity over present levels may amount to 40%. Bureau of Mines figures show 1954 capacity at 291,000,000 bbl, 1956 at 338,000,000 bbl, and 1959 capacity at 407,000,000 bbl.

Individual cement companies are beginning to announce new expansion programs. Calculation of the total investment in added plant capacity in the next five years is difficult because of the greater expense in building new plants than in expanding capacity of old plants.

However, there is not too much more room for expansion of old plants, since the increasing demand for cement since 1945 has been met largely by modernization. Plant modernization in the industry has almost reached the point of no return. The cement industry expanded rapidly in the 1920's but has added relatively few new plants since the 1930's.

New capacity in new plants costs around $10 a barrel. Thus the cement industry might spend about $1 billion in the next five years to build up its capacity.

Steel

No problems are foreseen in the supply of steel, either reinforcing or structural, to meet the needs of the enlarged highway program. Again, the normal growth of production capacities in the mills for the next few years is expected to keep pace easily with the build-up to full swing of an $8-billion a year pace.

Steel mills were operating at about 80% capacity in 1954. A possible shortage in wide-flange beams, foreseen briefly earlier this year, has been negated by the announced plans of a number of the larger steel producers to boost their wide-flange rolling ca-

Present Cement Capacities and Future Needs

Region	Capacity in 1,000 bbls. per year	$11-billion annual Highway Program needs in 1,000 bbls.*
1. New York and New England	18,500	16,798
2. Penn., Md., Dela., and N. J.	40,100	20,121
3. Ohio and West Virginia	25,700	14,190
4. Mich., Ill., Ind., Ky., Wisc	45,000	45,603
5. Southeast U. S.	40,200	20,092
6. N. D., S. D., Minn., Iowa	24,100	9,710
7. Neb., Kan., Mo., Okla., Ark.	20,200	15,353
8. Texas and New Mexico	22,900	6,386
9. Id., Mont., Wyo., Nev., Utah, Colo., Ariz.	10,700	1,781
10. Oregon and Washington	8,300	988
11. California	35,300	10,418
	291,000	161,440

Based on Bureau of Mines and ARBA figures.

*Due to regional highway specifications, needs are not proportional to planned system mileages.

For the LOW BID on any job, figure your costs with BARCO

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Gasoline
RAMMER

SOIL COMPACTION is here to stay! *Specified Compaction* **is now accepted practice on all modern construction projects. The BARCO RAMMER gives you specified compaction on these jobs at very little extra cost. Time after time, it has been proven that no other type of equipment can match BARCO PERFORMANCE:**

- **Better work! Easy to meet specifications calling for 95% to 97.5% (modified Proctor) compaction.**
- **Ideal for work in restricted areas: inside buildings, close to walls, culverts, and abutments — in trenches, ditches.**
- **Faster compaction! 20 to 30 cu. yds. per hour — day in and day out.**
- **One man operation! Completely self contained; no auxiliaries needed.**
- **Low operating cost. Low initial cost.**
- **SAFE! Simple to operate. Operators like Barco Rammers.**

ASK FOR A DEMONSTRATION—See for yourself—ask for our nearest distributor to give you a demonstration.

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Ask for Catalog 621

NEW McConnaughay
MULTI-PUG ASPHALT MIXER

REMOVES BOTH MOISTURE AND SOLVENTS

MODEL HTD-500

Prepares Hot or Cold Bituminous Mixtures—¼ Ton Capacity

Designed for economy of operation in the production of bituminous paving mixtures, this new McConnaughay HTD-500 Mixer is large enough (¼ ton capacity) for many resurfacing jobs as well as all types of pavement patching. Working on location, it provides the exact amount of material needed; never too much or too little. It has a low pressure burner directed into the mixing and heating unit through a combustion chamber. This HTD-500 and all McConnaughay HTD models are *the only mixers which effectively remove both moisture and solvents from bituminous mixtures* . . . giving you positive assurance that patches and resurfaced areas will set up hard as soon as the applied mixture cools. Write, wire or 'phone for details and specifications today.

McConnaughay HTD-500 at work on street patching job in Cheyenne, Wyoming.

K. E. McCONNAUGHAY
LAFAYETTE 2, INDIANA

pacities by as much as 50%. Wide-flange capacity is fairly crucial in highway work since it forms the largest tonnage in the types of structural steel used in bridge and overpass construction. An $8-billion yearly highway program would take about 750,000 tons of wide-flange shapes a year.

But there may be expected a certain amount of shortage in wide-flange shapes during the first years of the highway program, due to the time needed to build up new capacity. Once the new rolling facilities are in operation, though, the supply will be sufficient to meet the aggregate 10-year demand from all fields of the construction industry.

Wire mesh reinforcing is the only other steel item that might at first be expected to be in short supply, but predictions are that production capacity will grow at a rate that will keep up with all demands of the construction industry. Reinforcing bar production capacity is at present quite adequate for a gradual build-up in highway work, and should more be needed in the first few years of the program, most rolling mills could produce greatly increased quantities of rods simply by changing a few pieces of equipment in the plants.

Asphalt

Although asphalt presents no problem it is interesting to note some important aspects. From a highway construction viewpoint, asphalt production capacity is large enough to take care of the largest possible highway program. Current production of asphalt and road oils is around 80 million barrels, and current highway, airport and private pavement construction use is around 60 million barrels. Half of this figure is used at a fairly steady rate in road maintenance. The balance of 20 million barrels is an almost constant figure for supplying roofing and other industry needs.

At present, yearly production capacity, as estimated by the Bureau of Mines and the Asphalt Institute, is 210 million barrels, based on a 24 hour day. (The 24 hour day is completely feasible since refineries are virtually automatic, and the production of asphalt is not involved with labor rates to any appreciable extent.) This potential capacity could be totally devoted to producing asphalt for road use.

It is even further estimated that the asphalt production capacity in 1956 will be at 336,000,000 barrels approximately four times the amount produced in 1953. Such production could handle the largest possible highway program.

LIMA

SHOVELS - CRANES AND DRAGLINES CAN NOW BE HAD WITH *Torque Converter*

The greater production and lower costs possible with the addition of a Torque Converter, are being demonstrated daily by LIMA shovels, cranes and draglines, from the Type 34 to the 2400. These machines are consistently chalking up output records that heretofore were thought to be impossible from machines of their rated capacities.

Increase in output with converter is just one of the many advantages which the torque converter adds to LIMA shovels, cranes and draglines. Consider all of the other ways you will benefit from having a converter on any LIMA you buy. (Now standard equipment on all Type 703 and 803 machines and Type 2400 shovels; optional on all other LIMA shovels, cranes and draglines).

. . . The torque converter is an automatic hydraulic transmission which immediately adjusts the speed of the load to correspond with the resistance to moving the load . . . torque will be increased automatically as required by the load.

. . . Shock loading is minimized because the oil in the converter cushions any blow, increasing cable life and reducing machinery maintenance.

. . . Reduction of friction clutch slippage during accelerating, materially increases the life of friction clutches.

. . . Shovel performance is much smoother and faster because the converter automatically provides high torque at slow speeds and lower torque at high speeds.

SALES AGENTS IN PRINCIPAL CITIES OF THE WORLD

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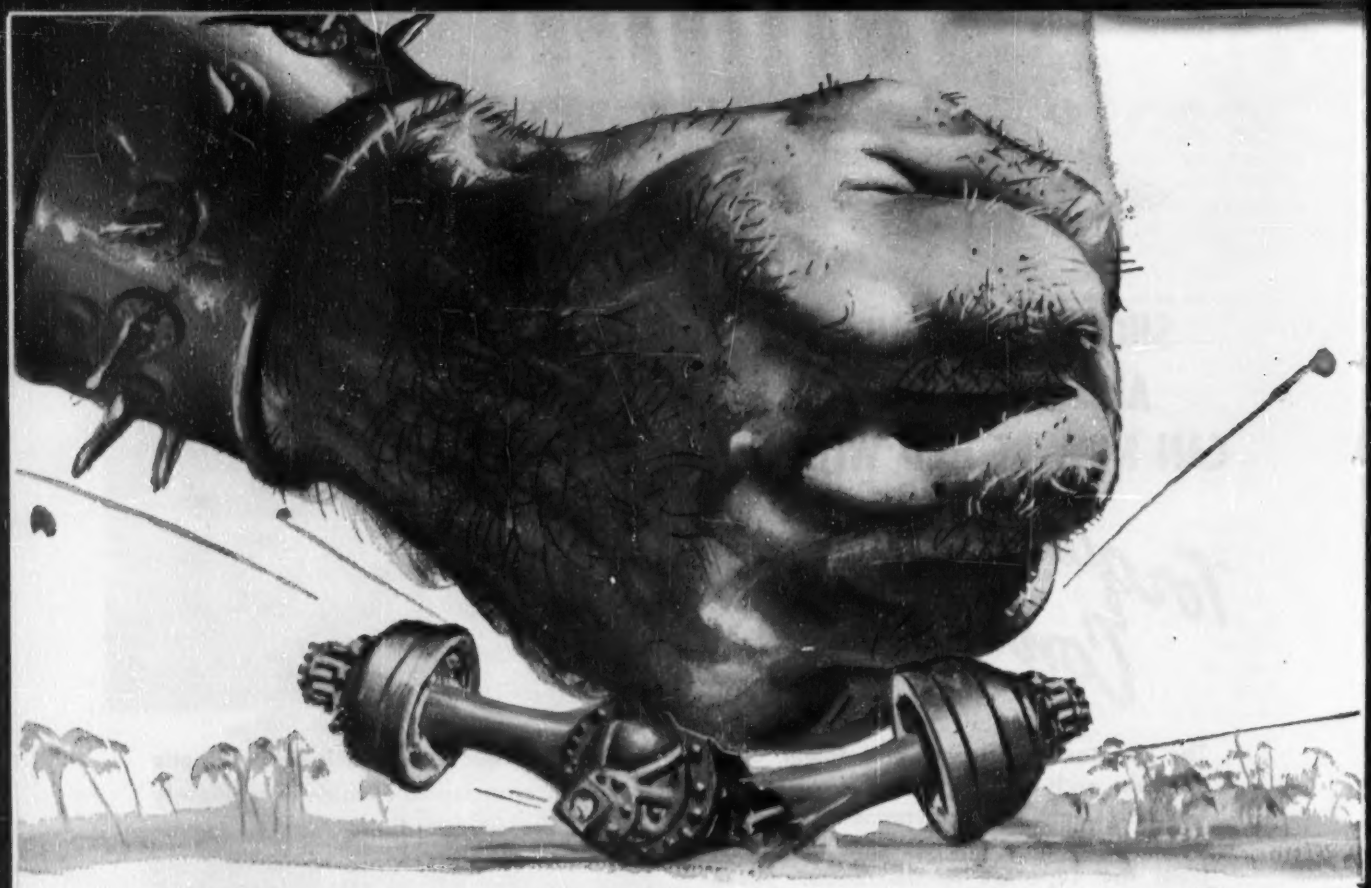
BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.



We smash truck axles

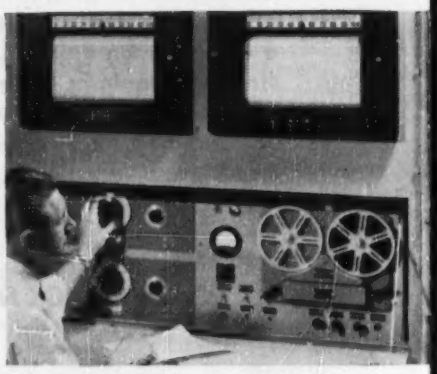
in the new Timken-Detroit indoor proving ground ...and only Timken has it!

We twist, bend, jounce and jerk them. Duplicate every possible operating condition. Then toss in some "torture-tricks" of our own.

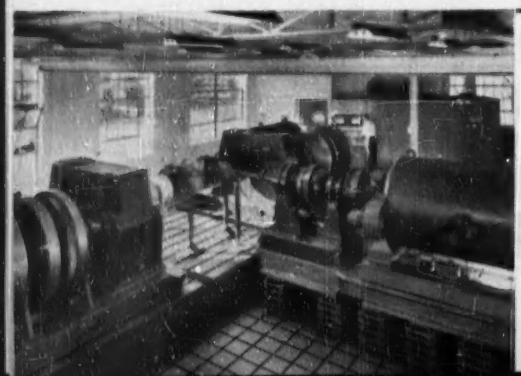
It's calculated destruction! But we know, and can tell you in advance, that a Timken-Detroit axle can take a murderous beating on the job.

Our "Torture Chamber" is a multi-thousand acre proving ground *capsuled into one room!* In it our engineers can put 50 years of experience to work . . . for you . . . experience gained in building axles for trucks, buses, trailers, farm machinery. Stock axles and gearing are subjected *indoors* to any *outdoor* operating condition—under scientific control and analysis.

The result? You enjoy longer axle life; less maintenance, repairs and downtime; lower operating costs, higher profits. Good reasons why Timken-Detroit axles are the choice of the leading manufacturers and owners.



This is our "Torture Tester." He gives axles and gearing the works in the "Torture Chamber." Above him are graphs showing speed and torque performance under any conceivable operating condition. Soft ground . . . twisting roads . . . long grades or fast highway speeds. With special dials, recorders, and electronic devices he actually *drives* the axle with scientific precision—*from his chair!*



How TDA proves axle quality in this "Torture Chamber"

We take an axle out of stock...then run a test like twisting the axle shaft 14°, backward and forward—36 times a minute, 24 hours a day, days on end. Or simulate a chuck hole shock every 4 seconds, 24 hours a day for months. Even "bend test" an axle housing for 1,000,000 cycles.

Far greater gear ratio "spread" with TDA 2-SPEED AXLES,

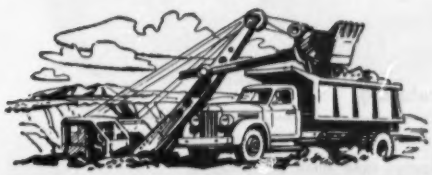
due to exclusive double-reduction design!

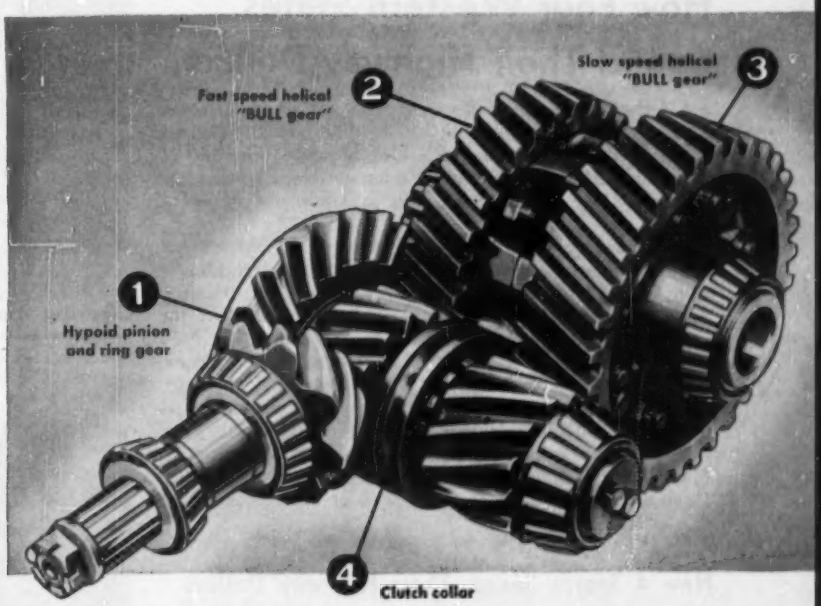
Unequalled Flexibility! Only Timken-Detroit 2-Speed axles are available in *three* different ratio "spreads" to meet any transmission-engine combination: 28%, 37% or 49%. Unlike ordinary designs that are limited to 37%, this Timken-Detroit Axle selection may be obtained simply by changing the low speed helical gear set.

Here's How the TDA 2-Speed Principle Works: A husky hypoid ring gear and bigger, stronger pinion set (No. 1 in illustration below) provides the *first step* of the total gear reduction for both fast and slow ratios. Two large, heavy-duty helical gear sets provide the *second step*. Both sets are of balanced size and capacity. One set (No. 2 in illustration below) is for fast speed—the other (No. 3) is for slow speed. The clutch collar (No. 4 in illustration) moves to left or right to engage one helical pinion or the other.

The Result: Complete elimination of small, complicated parts and midget-size gears! Larger hypoid-helical design gives more teeth in contact—reducing load per unit of contact area—for more positive, quiet operation. Bearings are larger. There's longer engine and truck life. When you divide the total gear reduction, you double its life expectancy. The helical pinion not in use idles. TDA gears operate in any ratio *indefinitely* without overheating.

to bits





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TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

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"TORTURE-TESTED"
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS

Plants at:
Detroit, Michigan
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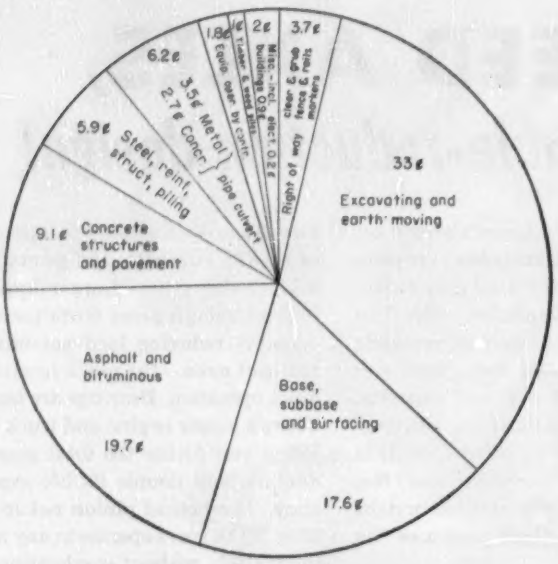
New Castle, Pennsylvania

7 basic axle capacities! Only TDA, world's largest manufacturers of truck, bus and trailer axles, offers a family of 7 basic axle capacities, each with *interchangeable* final drives: single-speed single-reduction—single-speed double-reduction—two-speed double-reduction—using the same axle shafts and housing. Nowhere is there such a selection to fit all needs.

Exclusive "Torsion-Flow" shafts! Forged so that grain structure of steel conforms to shaft profile, thus assuring uniform distribution of stresses. Exclusive heat-treating formula provides a resilient axle shaft core graduated to a tough, hard outer surface—the ideal combination for axle shaft life. And TDA "Torsion-Flow" shafts are guaranteed for 100,000 miles or 3 years—whichever occurs first.

Hot-forged steel housings! Pound for pound the strongest, most rigid ever built! Rectangular TDA housing shape gives maximum strength, uniform stress distribution, minimum weight. Ask about the TDA "Life of Vehicle" guarantee.

Where the highway contractor's dollar goes in 4 Western states



Based on quantities in 1953 contracts totaling $70 million as awarded by Oregon, Utah, Montana and New Mexico Chart © Engineering News-Record

How Four Western States Spend Their Highway Dollars

Of the dozen major classes of work on which highway contractors bid, earthmoving and hauling take the biggest slice of the highway dollar. This averages 33¢ out of each highway dollar in four Western states, 25¢ in New Mexico, 35.3¢ in Montana, 29¢ in Utah and 36.5¢ in Oregon.

The yardage moved adds up, too. Of contracts in 1953 totalling $70 million in these four states, excavation and earthmoving took almost a third for moving 42.9 million cu yds plus haul and overhaul, paid for separately, which topped 9.6 million yard miles.

Concrete accounted for 9¢ of this 4-state dollar. Yardage exceeded 94 thousand cu yd for structural concrete, 24.5 thousand sq yd for pavement, 72 thousand sq yd for base and 6.7 thousand sq yd for sidewalk.

Metal pipe and structural plate culverts added up to 326 thousand lineal feet, concrete pipe culvert to 267 thousand lineal feet to account for 5.2¢ out of that highway contract dollar.

How 4 States Spend Their Highway Dollars

Type of construction	New Mexico	Montana	Utah	Oregon	All 4 states
Right of way, clear and grub, markers, guide rails, cattle guards, fence	¢ 3.1*†	¢ 3.3	¢ 2.9*	¢ 4.4‡	¢ 3.7
Excavation and earthmoving	25.0	35.3	29.0	36.5	33.0
Base, subbase, surfacing material	14.5	26.4	22.6	14.3	17.6
Asphalt and bituminous	25.6	11.6	20.1	19.8	19.7
Concrete structures and pavement	9.4	6.8	9.2	9.8	9.1
Steel, reinforcing, structural, piling	8.5	7.1	4.8	4.7	5.9
Culvert pipe, metal	3.8	4.6	5.1	2.6	3.5
concrete	3.6	2.9	0.9	2.7	2.7
Timber and wood piling	0.6	2.0	0.4	1.1	1.0
Electrical	0.2	.....	.....	0.3	0.2
Equipment operation by contractor	5.7	.....	5.0	.....	1.8
Buildings	.....	.....	.....	1.9	0.9
Miscellaneous	$1.00	$1.00	$1.00	$1.00	$1.00
Total	.....	.....	.....	1.9	0.9

†Includes cattle guards 0.0¢ *Includes fences and gates 2.3¢
‡Includes clearing and grubbing 2.9¢, guide rails and markers 0.3¢ and roadside improvement 0.2¢

Road Cost Per Mile Refined For Fast Estimating

For preliminary, speedy budget estimating, road costs per mile give the most useful values. How these range for various classes of construction is shown in reports from three states:

• **Pennsylvania** reports present construction costs by contract to be:

Type of road	Cost range per mile		
2-lane concrete	$169,000	to	$310,000
3-lane concrete	281,000		479,000
4-lane concrete	320,000		2,064,000
2-lane macadam	43,000		176,000
3-lane macadam	136,000		285,000

• **Michigan** lists average costs per mile for these classes of roads:

Type of improvement	Cost per mile—1953 Average	Range
Grading and drainage structures		
single roadway	$62,000	$30,400–73,900
dual roadway	65,500	
single and dual roadway	90,000	
and 22-ft conc pavement, 8" uniform	89,000	83,000–97,000
and 40-ft & 44-ft conc pavement and conc curb & gutter	283,000	
and 12-ft conc base widening, R&L	156,900	
15-ft conc base widening, R&L	166,800	
dual roadway, 22-ft, 31-ft, & 33-ft conc pave, 9" unif, conc C&G	293,000	
11-ft & 12-ft conc pave widen, R&L and 44-ft conc pave, 9" unif	260,000	
conc pave widen, 22-ft & 44-ft conc pavement	216,000	
and 23-ft stabilized agg surface	61,000	43,000–73,000
and 18-ft aggregate surface	19,000	
22-ft concrete pavement surfacing	60,200	
dual 24-ft conc pavement, 9" uniform	224,400	
23-ft stabilized aggregate surface	23,500	
20-ft bituminous concrete	19,100	15,500–21,800
22-ft bituminous concrete	20,000	15,100–25,600
2-24-ft bituminous concrete	75,100	15,100–25,000
Binder widening R&L, 22-ft bit conc	25,600	22,000–29,300
47-ft and 72-ft bituminous concrete	69,900	
70-ft, 80-ft & 82-ft bituminous conc	78,800	
Asph undersealing & 40-ft bit conc	86,600	

• **Oregon** converts unit prices to average cost per mile according to width of grade and average cut and fill. How these work out is shown in the tables. All costs shown include 12.5% for engineering and contingencies.

Clearing and Grubbing

(Tractors, clearing dozers, donkeys, power saws, flame throwers and explosives used when practical)

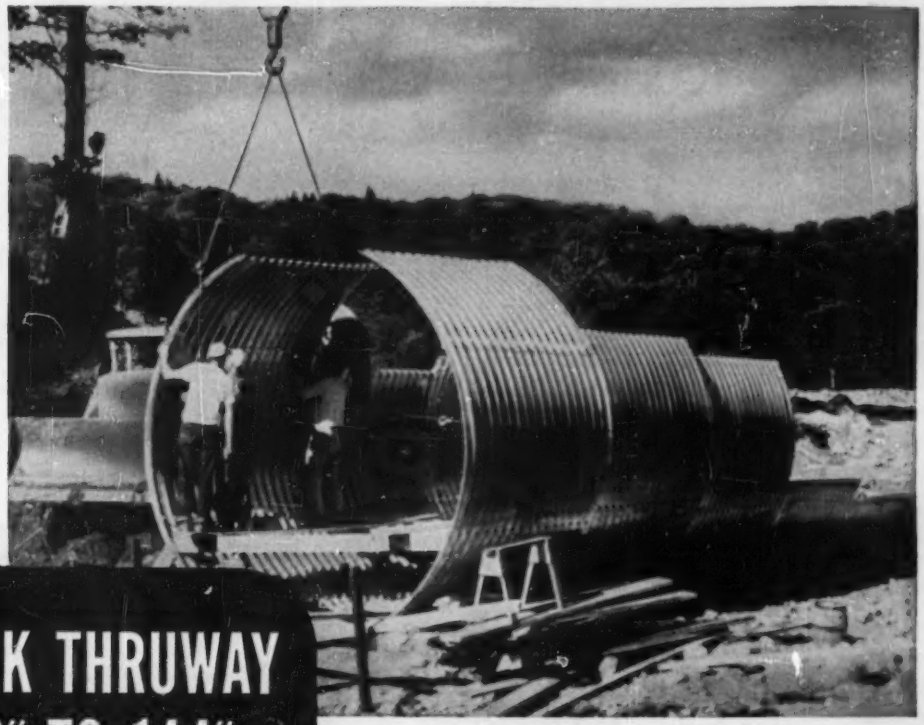
	Cost per acre	Cost per mile by width cleared 30 Feet	60 Feet	80 Feet	100 Feet
Light					
Widening existing highway, cleanup brush, fence rows etc.	.....	$500	.....	.....	.....
Sagebrush and juniper, Eastern Oregon	$35	.....	$325	$425	$550
Scattered trees, brush, orchard, etc.	125	.....	1,200	1,600	2,000
Medium					
Southern Oregon, pine, fir, laurel, etc.	400	.....	3,650	4,800	6,000
Second growth fir, oak, maple, alder, etc.	600	.....	5,450	7,300	9,100
Heavy					
Cascade Range	850	.....	8,100	10,800	13,500
Coast Range	1,500	.....	15,200	20,400	25,300

Table V—Shoulder rock surfacing—2 sides

($2.35/cy, 2 sizes of crushed rock used when depth exceeds 3". shrinkage and compaction allowance, 25%; water, 30 gal/cy of crushed rock)

Compact thickness	Cost per mile for both sides by top width in feet (each side) 2	4	6	8	10	12
1 inch	$210	$425	$635	$845	$1,060	$1,280
2 inch	430	845	1,280	1,705	2,130	2,580
3 inch	650	1,280	1,910	2,565	3,210	3,840
4 inch	865	1,730	2,565	3,430	4,285	5,130
5 inch	1,100	2,140	3,220	4,285	5,350	6,410

Continued on page 93



Workmen bolting together 144" diameter Armco MULTI-PLATE Pipe for New York Thruway.

NEW YORK THRUWAY USES 6" TO 144" ARMCO PIPE UNDER PAVEMENT

By actual count, 27 different sizes of Armco Corrugated Metal Drainage Structures were installed under the pavement of the New York Thruway. These included various sizes of Armco Corrugated Metal Pipe, Pipe-Arch, MULTI-PLATE Pipe, and MULTI-PLATE Pipe-Arch.

All of these metal structures are designed for fast, easy, labor-saving installation. It is a simple matter to join 20-foot sections of standard corrugated metal pipe with bolted coupling bands. MULTI-PLATE structures are assembled by bolting curved and corrugated plates together. Tamping and backfilling completes the job for either structure.

More and more of today's modern turnpikes and expressways are using Armco Metal Drainage Structures. They are strong, durable and can be installed under almost any fill height. For complete information write Armco Drainage & Metal Products, Inc., 3554 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Assembled 60" diameter Armco MULTI-PLATE Pipe ready for backfilling

ARMCO DRAINAGE STRUCTURES

ARMCO

. . . Cost per mile, Oregon

Excavation

(Includes truck haul, overhaul, finishing roadbed and slopes, rounding cutbanks)

Grading, common excavation ($0.26/cy)

Average cut & fill	Average cost per mile by width of grade in feet: 26	30	34	38	42	46
2-foot	$2,225	$2,530	$2,850	$3,185	$3,500	$3,815
5-foot	6,180	6,950	7,725	8,550	9,345	9,945
10-foot	14,340	15,885	17,505	19,095	20,690	22,305
15-foot	24,480	26,850	29,260	31,625	34,505	35,420
20-foot	36,600	39,785	42,975	46,135	49,345	52,535
25-foot	50,700	54,660	58,715	62,675	66,635	70,690
30-foot	66,825	71,605	74,360	81,310	85,950	90,775

Grading, ⅓ solid, ⅔ common ($0.46/cy)

2-foot	$3,215	$3,655	$4,115	$4,560	$5,030	$5,490
5-foot	8,860	9,990	11,115	12,270	13,420	14,260
10-foot	20,545	22,805	25,090	27,370	29,675	31,975
15-foot	35,075	38,510	41,920	45,370	48,805	52,260
20-foot	52,480	57,065	61,605	66,165	70,750	75,290
25-foot	73,075	78,390	84,150	89,865	95,555	101,335
30-foot	95,840	102,660	109,510	116,300	123,125	130,120

Grading, ⅔ solid, ⅓ common ($0.65/cy)

2-foot	$4,160	$4,735	$5,370	$5,960	$6,560	$7,150
5-foot	11,520	13,010	14,520	16,005	17,515	18,615
10-foot	26,750	29,760	32,735	35,665	38,720	41,690
15-foot	45,750	50,225	54,685	59,185	63,600	68,100
20-foot	68,400	74,385	80,330	86,270	92,260	98,245
25-foot	94,850	102,325	109,710	118,630	124,655	132,045
30-foot	124,990	133,910	142,825	151,740	160,660	169,660

Grading, solid ($0.85/cy)

2-foot	$5,615	$6,370	$7,190	$7,945	$8,765	$9,565
5-foot	15,440	17,440	19,430	21,395	23,400	24,872
10-foot	35,840	39,815	43,785	47,780	51,730	55,700
15-foot	61,230	67,190	73,190	79,090	84,375	91,070
20-foot	91,155	99,575	107,520	115,470	123,450	131,270
25-foot	126,870	136,800	146,815	156,750	166,680	176,700
30-foot	167,285	179,205	190,860	202,955	214,960	226,950

Surfacing

Topping—pit-run gravel or talus

($0.95/cy, shrinkage and compaction allowance 20%)

Compact thickness	Cost per mile by width in feet: 22	26	30	34	38	42
3 inches	$1,405	$1,655	$1,905	$2,145	$2,405	$2,660
6 inches	2,855	3,355	3,850	4,360	4,860	5,360
9 inches	4,345	5,100	5,850	6,600	7,355	8,105

Topping—pit-run cinders

($0.73/cy, shrinkage and compaction 30%)

3 inches	$1,165	$1,370	$1,580	$1,790	$2,000	$2,205
6 inches	2,370	2,790	3,200	3,620	4,030	4,450
9 inches	3,605	4,235	4,855	5,480	6,105	6,730

Crushed rock or gravel surfacing

($2.15/cy, 2 sizes used when depth exceeds 2", shrinkage and compaction allowance 25%, 30 gal of water per cy of crushed rock)

2 inches	$2,375	$2,800	$3,230	$3,650	$4,085	$4,515
4 inches	4,790	5,640	6,495	7,355	8,195	9,045
6 inches	6,155	8,550	8,825	11,115	12,400	13,665
8 inches	9,800	11,505	13,220	14,925	16,640	18,335
10 inches	11,000	14,310	16,630	18,700	20,900	23,000

Crushed cinder surfacing

($1.70/cy, shrinkage and compaction 30%, water, 40 gal/cy of crushed cinders)

1 inch	$960	$1,135	$1,305	$1,480	$1,655	$1,825
2 inches	1,925	2,270	2,615	2,960	3,305	3,680
3 inches	2,910	3,430	3,955	4,475	4,995	5,515
4 inches	3,900	4,600	5,290	5,980	6,675	7,365

Drainage and irrigation

(Includes structural excavation and backfilling)

	Eastern Oregon	Central Oregon	Willamette Valley	Coast mountains
Average cost per mile	$2,810	$2,080	$3,240	$6,700

Based on	per lf
Concrete drain pipe, 4"	$0.90
6"	1.00
8"	1.30
Concrete sewer pipe, 8"	1.50
Concrete culvert pipe 12"	2.70
18"	4.40
24"	5.70
36"	12.30
Cor metal culv pipe 12"	3.80
18"	5.50
24"	7.45

Based on	per lf
30"	10.75
Cor metal culv pipe 36"	14.10
48"	21.20
Catch basins, each	87.00
Manholes, each	235.00
Concrete box culverts, incl wingwalls 3x3	23.20
4x4	32.75
5x5	40.75
6x6	50.50
8x8	65.50
9x9	75.00

Pavement

Bituminous macadam wearing surface, penetration type

(Based on average bid: preparation of base, $200/mi; aggregate in place $3.75/cy; asphalt in place $41/t; cutback in place $45/t. If a tack coat is required add $1,000/mi for additional 15t asphalt and 150 cy aggregate)

Thickness	Cost per mile by width in feet: 18	20	22	24
2 inches	$6,725	$7,475	$8,225	$8,965
2½ inch	8,555	9,505	10,455	11,405
3 inch	9,180	10,205	11,230	12,260

Asphaltic concrete pavement

(Based on C1 A, B, C, D & E asphaltic concrete in place at $5.90/t, 1 cy = 4,000 lb, shrinkage and compaction allowance, 5%)

Compacted				
2 inch	$7,965	$8,840	$9,720	$10,620
3 inch	11,950	13,275	14,580	15,930
4 inch	15,930	17,710	19,440	21,240
5 inch	19,845	22,070	24,300	26,505

Portland cement concrete

($3.50/sy, 8" standard, includes 8% for sand cushion, dowels, tie bars, expansion and contraction joints)

Standard				
6 inch	$43,700	$48,600	$53,400	$58,200
7 inch	39,700	44,100	48,600	52,900

Oil mat surface treatment

(Based on preparation of base, $200/mi; aggregate in place $3.75/cy; 151-200 asphalt in place, $41/t; cutback in place, $45/t. For a binder course add $1,000/mi)

¾ inch	$3,015	$3,350	$3,680	.....
1¼ inch	4,970	5,510	6,060	.....
1½ inch	1,420	1,575	1,730	.....
⅞ inch	930	1,025	1,135	.....

Roadmix surface treatment

(Includes preparation of base, tack coat, aggregate, RC-3 cutback, mixing, finishing, seal coat)

2 inch	$5,000	$5,500	.....	.....
2½ inch	6,000	6,600	.....	.....

Guard fence, sight posts

(Based on guard fence at $2.50/lf, sight and mail box posts at $9 ea)

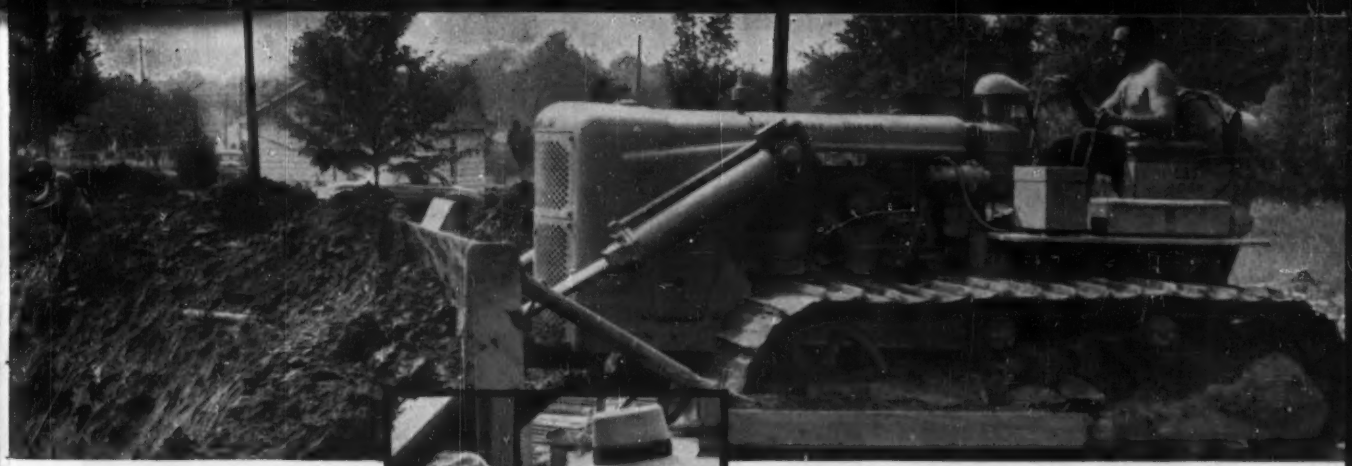
	Flat no sharp curves	Hilly, with sharp curves	Mountainous extreme sharp curves
Average cost per mile	$300	$1,500	$3,000

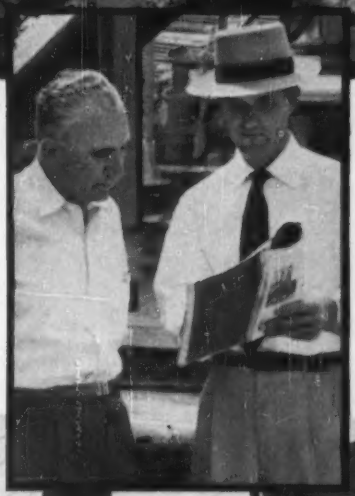
Structures

	Cost per lineal foot by height: Under 20 feet	20 to 25 feet	Over 25 feet	Varied
Composite trussed timber trestle	$225.00	$240.00	$250.00	.....
Composite I beam span	290.00	325.00	350.00	.....
Steel trusses, 120-ft span	.....	.....	.....	$325.00
Steel girders, 60- to 90-ft span	.....	.....	.....	375.00
Concrete arches, 200-ft span	.....	.....	.....	600.00
Concrete Viaducts	300.00	340.00	375.00	.....

Misc., not cost per mile

Cement rubble masonry	$50.00/cy
Dry rubble masonry	16.00/cy
Rock parapet walls	16.00/lf
Riprap	$6.00/cy
Concrete curbs	1.50/lf
Concrete sidewalks	3.50/sy





Jim Reo (left), president of Waterway Construction Company, and Frank J. Wolan, Standard Oil Automotive Engineer, work closely together to keep Waterway's earthmoving equipment on the job. This type of co-operation is available to you. Just call your nearest Standard Oil office. Or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

"How we cut costs in 'dozing and digging"

STANOLUBE HD-M Motor Oil

"You've got to keep equipment on the job to keep costs down and make money in earthmoving," says Jim Reo, president of Waterway Construction Company, Detroit, Michigan. "It's a close-margin business that often calls for round-the-clock schedules of full-load operation."

To help him keep on schedule, Jim Reo has relied on Standard Oil products and the help of Standard Oil Automotive Engineers for over 32 years. Since it was first introduced, he has used STANOLUBE HD-M Motor Oil in all 25 pieces of his equipment. During that period there has been no scuffing of rings or liners, no ring sticking, no plugging of oil control rings . . . in fact, no downtime whatsoever because of oil failure.

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STANDARD

Freeway
SEPULVEDA
Future

It can be streamlined

Biggest Roadblock: Right-of-way Acquisition

In the hodgepodge of state highway laws the most conspicuous and costly roadblocks are found in provisions for right-of-way purchase. Many state legislatures need to make new, realistic acquisition laws, complying with standards that might even be imposed as a condition for receiving federal aid. California's law is cited often as eminently adapted to today's fast-growth problems and to handling land acquisition in a foresighted manner.

To jump ahead of the land-price spiral that usually fore-runs expressway construction, California has a $30 million revolving fund for advance right-of-way purchase. Terming the fund an "outstanding success," E. F. Wagner has told how it works, in a paper presented before the Western Association of State Highway Officials.

Mr. Wagner, who is deputy chief right-of-way agent for the California Division of Highways, cites one instance where property acquired in 1948 for $100,000 would have cost more than $2 million if bought at freeway construction time.

This is an abstract of Mr. Wagner's paper:

Most difficult among the problems of long-range highway planners is protection of future alignments from further building development within the proposed right of way.

The solution usually may be sought by three methods: Zoning restrictions, acquisition of highway-development rights, and advance purchase. Zoning, although it has been successful along existing routes, has not worked well where brand-new locations were anticipated. Highway development rights, amounting to restrictive covenants on land use, also may apply best to existing routes, but probably are not adaptable to opening or widening limited-access highways.

Advance purchase of land while still vacant, on the other hand, lends itself most readily to protection of future rights of way.

Financing such purchases is the stumbling block, particularly because of the unrelenting demands for spending current highway funds on construction, immediately. Justification of advance purchase must depend on the answer to the question, "Will future benefits justify expenditure at the present time?"

California not only has answered this question affirmatively in many cases, but also has a working program for finance. It is a $30 million revolving fund set aside for advance buying. The fund was set up in 1952 and 1953 after the state had been forced to advance-purchase a few parcels in order to forestall major building developments. When an advance purchase is made, the money comes out of the fund; later, when construction begins, the amount that has been paid for the land is reimbursed to the revolving fund, out of construction project money.

A time-limit safeguard is imposed by the requirement that all repayments must be repaid by July 1, 1962.

Advance planning has been accelerated by this legislation, because California can adopt future routes officially, with assurance that the right-of-way will be protected. The status of the right-of-way is frozen until active acquisition commences on the remaining improved properties, before construction starts.

Although California confines its major advance right-of-way acquisitions to vacant properties in suburban areas, improved industrial properties occasionally are taken in order to forestall further expansion of existing building facilities.

Before an advance-purchase plan can be put into operation, the highway department must expand to handle the following functions:

1. Development of a comprehensive plan for future freeways.
2. Planning and design sufficient to provide advance preliminary plans for determining right-of-way requirements, and for preparing deed descriptions.
3. Negotiation with property owners (beyond current dealings).
4. Management for interim use of the land; generally, vacant lands are rented back to the sellers, or to adjoining property owners.

An excellent example of the benefits obtainable by advance purchase is found along the future Sepulveda Freeway, in Los Angeles County.

A section of the right-of-way (outlined on the photo) was bought in 1948 for a little more than $100,000. Since then, two-story apartments have been built on both sides. Assuming similar development within the right-of-way, at today's values it would cost more than $2 million for improvements, and an additional $200,000 for land and severance damages.

In contrast, the Division of Highways is faced with a near-$2 million expenditure for a fully built-up section of the same expressway. This section could have been bought for $35,000 in 1945, when only five percent of the area was developed.

At present, California is spending about $7 million annually on advance right-of-way acquisition. Delays in purchase could add many hundreds of million of dollars to the costs.

Other major benefits in advance purchase can be listed briefly:

1. Orderly planning of an expressway system, with assurance that plans can be carried out.
2. Decreased economic waste that otherwise would result from demolition of near-new improvements.
3. More orderly development of ad jacent property.
4. Minimum inconvenience to residents.
5. Prevention of the automatic pyramiding of land values ahead of right-of-way acquisition (when it takes place just before construction).

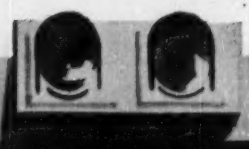
Mr. Wagner states, "In years past, when limited funds permitted only the gradual acquisition of right of way . . . from the center of metropolitan areas out toward the fringes thereof, we were constantly lagging behind and following the land development of the areas traversed . . . (We) were in a way the victim of our own Frankenstein in that our own freeway improvements actually promoted land development so rapidly as to make it almost impossible to catch up on right-of-way acquisition.

"Fortunately, our Right of Way Acquisition Fund . . . now provides us with a most efficient and effective means of jumping out ahead and purchasing undeveloped properties . . ."

Mr. Wagner further asserts that in a long-range highway planning program, advance right-of-way acquisition ". . . is undoubtedly the single greatest economy that can be made in the highway plant investment."

In California experience, the procedure has been an outstanding success, Mr. Wagner concludes.

ADVANCE PURCHASE for Sepulveda Freeway took place in 1948 when land adjoining the acquired right of way (outlined) was undeveloped. New houses now flank it, but without advance purchase, they would have been built all the way across, adding upwards of $2 million to the expressway cost.



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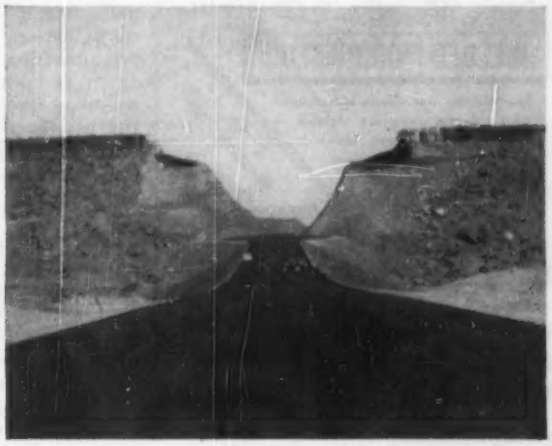
Where the Highway Dollar Goes . . .

REALIGNMENT is the best answer where short curves and nasty grades cut road capacity, encourage unsafe driving. In California, old foothill highway (left) was moved across creek to improve grades and sight distances (right).



TUNNEL WAS FINE for every-day traffic through this Utah ridge (left), but became a needle's eye as volume grew. Deep cut (right) reduced grades, improved visibility and made room for the traffic on U. S. 91.

LITTLE-KNOWN ROADS, like this one in Pennsylvania, must be improved, too. For the farm-to-market route has not diminished in importance. Roadbuilders have developed a broad range of surface types to meet any rural traffic requirements.

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Air Maps, Seismology Speed Design

Total project time—from idea to completed highway—became a matter of major importance when mushrooming toll roads brought a new speed incentive: The sooner the money came in, the lower the financing cost.

Construction speed couldn't be raised sharply because contractors, who had a money motive, regularly adopted better methods as soon as they were available. The speed-up burden thus fell on the planning and design phase, where a more leisurely approach had been the rule.

Photogrammetry was the first tool embraced by the planners; in one stroke it erased much of the tedious field work that formerly had characterized the assembly of preliminary topographic data.

More recently another technique, refraction seismology, has lopped still more time from planning, hastening earth and rock excavation estimates by eliminating a large amount of slow, expensive borings. Major uses of this technique can be found only within the past two years, notably for the Greenwich-Killingly Expressway in Connecticut and for the Massachusetts Turnpike.

• **Penn extension first**—Growth of aerial mapping for roadwork, on the other hand, has filled the postwar years. Photogrammetry itself had come of age during the 'Thirties, becoming a ready-made tool for military mapping during World War II. Shortly afterward the Pennsylvania Turnpike Commission wanted to extend its pioneer road eastward 140 miles, and wanted to deliver the facility fast.

First requirement was a topographic map, covering a mile in width along the whole route. The map sheets were produced by a photogrammetric firm in 145 days—estimated by engineers to be one-fifth the time that would have been required to deliver a ground-surveyed map. The cost, too, was one-fifth of that for conventional methods of the time.

Since then, air mapping has been the standard approach to turnpike engineering. Moreover, some states have used it for much of their public works. For example, Mississippi has done some of its own photogrammetry, and California performs a large volume of it by contract.

Today contract air mapping is an active, competitive business, complete with a trade association. The Association of Professional Photogrammetrists, in Washington, D. C., say that 25,000 miles of new highways and turnpikes were surveyed by ten member firms in 1954. This is the bulk of the work, but 20 other firms are active in the field.

Strides in methods, meanwhile, have outshone the performance for the Pennsylvania Turnpike's eastern extension. This fall, half-mile-wide maps for 475 miles of Illinois Turnpike were delivered by a firm in 75 days. In general these location maps are made to the scale 1 in. equals 200 ft, with five-foot contours.

• **For design too**—The method has been extended in a few cases, however, to pre-construction maps with one-foot contours. Such a map was used for design of a four-mile route near Providence, R. I., the earthwork quantity estimates being taken directly from the map, rather than by field cross-section parties. To check the air map, engineers took cross-sections on a typical 1000-ft strip, finding a net variation of 0.15% between volumes taken off the map and volumes measured in the field.

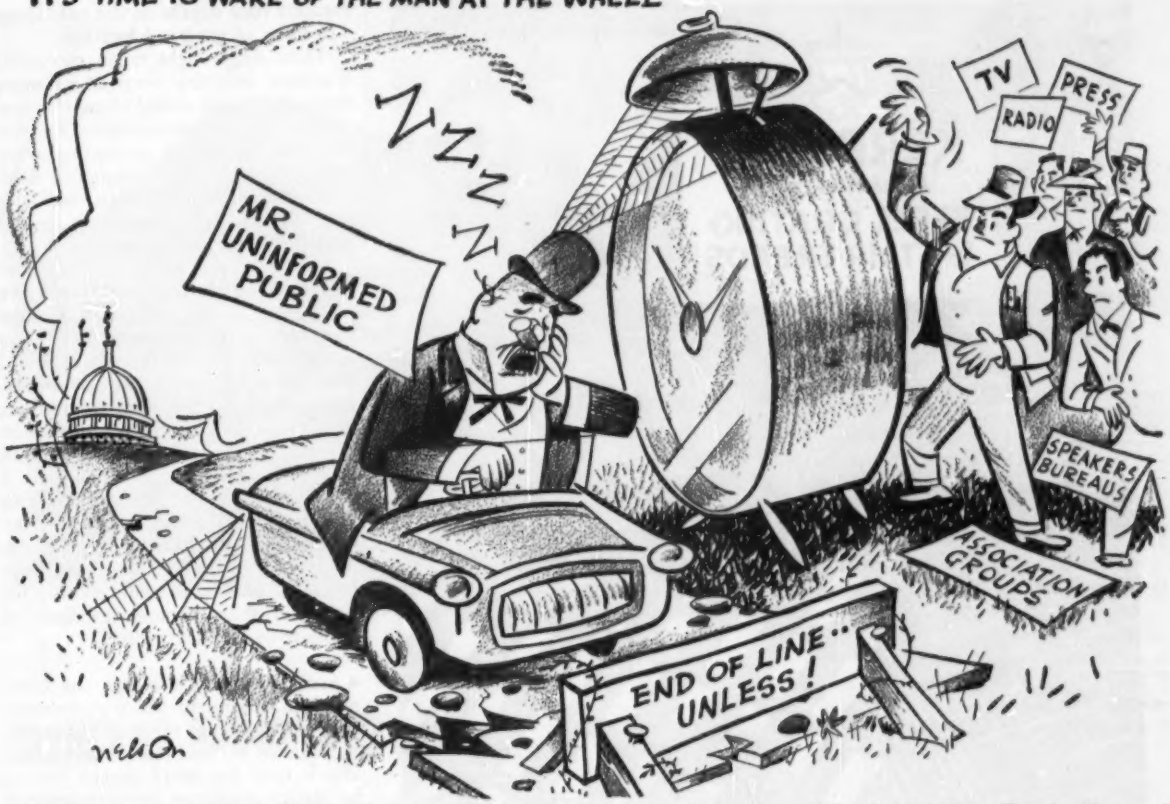
Engineers estimated a time saving of 40%, compared to field cross-sectioning, when a contour grading plan method of takeoff was used on the topo maps. Further, in their opinion, earthwork quantities accurate within 5%—good enough for preliminary project estimating, though not for contract estimates—can be obtained from today's 10-ft-contour air maps.

• **Seismic surveys**—If rock is likely to be encountered, the newer technique, refraction seismography, can be brought into play, enabling estimators to separate earth from rock excavation. Developed during a period of 30 years for oil explorations, the equipment within the past ten years had been improved to the point where it could measure shallow depths to rock.

At this point construction people began to take an interest in it, and a few applications were made. One experimenter was Rev. Daniel Linehan, S. J., director of the Weston (Mass.) Observatory. Working with Gahagan Construction Corp., of New York, he supervised the first seismic investigation for a major highway in the fall of 1953. This work was for Ammann and Whitney, New York consultants, who had but three months to make the preliminary engineering report on Greenwich-Killingly expressway (now under construction).

Beginning Sept. 1, a four-man seismic crew took only five weeks to

IT'S TIME TO WAKE UP THE MAN AT THE WHEEL



DECISIONS WILL BE MADE in the coming months that will affect your business for the next generation.

The men and women who will make these decisions include factory people, farmers, cab drivers, doctors, your groceryman, your next door neighbor . . . yes, even you!

The people decide

Officially, of course, it will be Congress which decides the fate of the President's Highway Program . . . but never in the history of a democratic government has a legislative body ever launched a bold spending program unless it was confident that the constituent majority was willing to go along.

It isn't enough that we simply demonstrate the need for a more adequate highway system to ourselves, or to the Congress. We must show the *voter* that the need is *so* acute and the benefits *so* great, that *his* part in this huge investment is actually a small one considering the value he'll receive . . . that in the long run, it will be economical, and a safeguard to the lives of so many.

In this, we are failing. The average voter too seldom sees the problem mentioned in his newspaper or general magazines. He seldom hears it on radio or views it on television. His friends seldom discuss it since they are usually as uninformed as he. So he remains largely indifferent at a time when his Congressmen prepare to face the issue.

Shaking a public lethargy must be our number one priority job during these next critical months. It is not alone the job for the manufacturer, the material supplier, the equipment distributor, or the highway contractor. It is the job for every group of Americans who are interested in seeing our nation have the kind of roads it so badly needs.

Effective communication needed

Every effective means of communication should be considered. Publishers, editors, and news commentators must be informed of the far reaching effects of this program. Civic, social, and business groups should be reminded of their stake in the results to be achieved.

Even these comparatively well-informed men will be amazed to learn the average volume of traffic borne by a familiar street or highway during a 24 hour period. They'll be shocked to hear that unfavorable road conditions are associated with nearly one-third of our annual toll of 38,000 traffic deaths and 1,350,000 traffic injuries.

Cost is small, proportionally

Remind them, too, that their personal transportation costs for automobile depreciation, repair, gas, oil, accessories, and insurance probably exceeds their share of road costs by around 10 to 1!

And explain that *most frightening of all*, we're *losing ground*. Our present highway building program isn't keeping pace with the increasing volume of traffic.

The President has displayed outstanding leadership and foresight in proposing his bold, but realistic, long range Highway Program.

It is *our* job to match his leadership with *our* efforts to assure favorable action by Congress. It may be many years before such an opportunity again presents itself.

Now is the time for action. Not next month, next summer, or next year . . . but *NOW*!

Pioneer *Continuflo* **EQUIPMENT**

Prepared in the interest of better highways . . . by PIONEER ENGINEERING WORKS, INC., *Minneapolis 13, Minnesota. (Subsidiary of Poor & Co., Chicago)*

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Write for FREE desk-size grating sample

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General Sales Office — 274 Madison Ave. — New York City

measure rock depths in the cuts along 129 miles of proposed location.

Their single light truck contained a seismic unit that received impulses from geophones strung along the centerline. The geophone, about the size of a fist, contains a spring-suspended vertical coil in a magnetic field. Ground-transmitted sound oscillates the magnetic field, sending an electric impulse to the oscillograph.

Source of the sound on the Connecticut job was a light explosive charge, set off in a shallow hole near one end of the geophone line. The sound waves traveled down to rock and were refracted up to the geophones. Each successive geophone received its first wave at a later instant, a function of the greater distance of sound travel through the overburden. A second shot, set off at the other end of the geophone line, completed the observation. With each shot, the seismograph recorded separate wave lines for each geophone. The records for a pair of shots became the basis of depth-to-rock calculations.

• **Accuracy good**—Although the Connecticut assignment was a preliminary survey, requiring only a centerline rock profile in most cases, the method also is used for detail design surveys by placing geophone strings transverse to the centerline and taking rock cross-sections. With expert interpretation, accuracy is good. Check borings showed seismic depths consistently within 2 ft in some cases within inches, of actual boring depths on the Massachusetts Turnpike. Seismic surveys were used for design and quantity estimation throughout that project.

Where such accuracies are adequate, the savings in time and money are obvious. Money for boring, then, can be concentrated at more critical locations, like bridge sites and soft ground requiring subsurface evaluation.

Not that seismology is ruled out for bridge engineering. In fact it can prevent blunders. In Massachusetts, ledge at one bridge site was fixed seismically at 25 ft after a boring had hit rock at 9 ft. Presumably it was a boulder. Furthermore, the investigations can be made under water, to determine depth of soft earth over rock. It was this capability of seismics that got Gahagan into the new work. Largely a dredging firm, Gahagan was seeking to find a cheaper means for making subaqueous surveys.

Neither seismic investigation nor photogrammetry fully supplants, respectively, borings and ground surveying. But each short-cuts traditional procedures, abbreviating total project time and speeding the roadbuilder's millenium.

NEW RF-230 60,000 lbs. GVW six-wheeler, one of 25 six-wheel models—all with famous, extra-rugged INTERNATIONAL bogie.

NEW MODELS
NEW FEATURES

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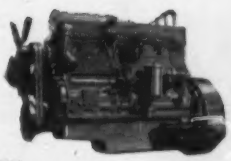
INTERNATIONAL continually brings you great new truck features, new all-truck models, new value for your truck dollars, in the world's most complete truck line. INTERNATIONAL follows this policy to give you right now the developments that will help you do your hauling jobs better, cut your costs and boost your profits. Before you make any truck purchase, check all the new developments shown here—then let your INTERNATIONAL Dealer or Branch give you *all* the reasons why an INTERNATIONAL is your best truck buy.

INTERNATIONAL HARVESTER COMPANY • CHICAGO



NEW increased power, with all-new 201-hp Royal Red Diamond 501 engine standard in new high-power-to-weight 220 Series models.

NEW space-saving, high economy, big capacity COE models—3 series, 12 models from 21,000 to 30,000 lbs. GVW—50,000 to 65,000 lbs. GCW. Also available with sleeper cab.

NEW Super Space Saver ROADLINER® conventional truck-tractors that haul all 35-foot trailers in 45-foot limit. GCW, 42,000-65,000 lbs.

NEW factory-installed 50-inch one-man cab that permits balanced, 2-side loading of steel, lumber, pipe and other longer-than-truck materials.

NEW power steering for all models. New light-duty truck features include tubeless tires, optional automatic transmission and overdrive.

NEW multi-stop models with METRO® bodies—14,000 to 16,000 lbs. GVW. 10 other models—5,400 to 11,000 lbs. GVW with METRO and METROETTE bodies—available with new METRO-Matic transmission.

PLUS four-wheel-drive models of 11,000 and 15,000 lbs. GVW—built for lowest cost operation in roughest, toughest terrain.

PLUS factory-installed, Underwriters approved LPG power, available as optional equipment in 54 models from 4,200 to 45,000 lbs. GVW.

PLUS 10 diesel engines for 30 models. The INTERNATIONAL line of 185 basic models offers widest choice of power—30 engines, gasoline, LPG and diesel.

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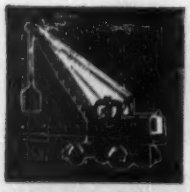
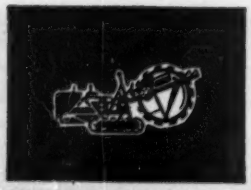
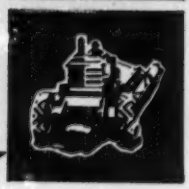
INTERNATIONAL TRUCKS

Standard of the Highway



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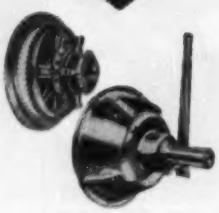

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OBITUARIES

W. Harold Johnson, 63, a general contractor for 20 years in Toledo, Ohio, died Nov. 30.

George F. Pawling, 75, formerly an engineer with the old Philadelphia Rapid Transit Co., died in Philadelphia Dec. 2. He organized his own construction firm, George F. Pawling & Co., and served from 1911 to 1926 as president and treasurer.

Frank Garger, 29, of Elmsford, N. Y., a civil engineer with Clark & Rapuano, New York City, consulting engineers, was killed Nov. 30 in a truck accident that occurred while he was working on the New York Thruway interchange at Suffern.

Morris Macht, 64, president of Welsh Construction Co. and its subsidiaries, died Nov. 29 in Baltimore.

George E. Routsong, 45, founder of Routsong Construction Co., Dayton, Ohio, died Dec. 1.

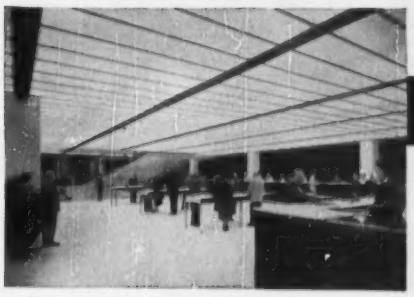
Walter E. Anderson, 83, founder of W. E. Anderson Sons Co. concrete firm, died Nov. 28, in Columbus, Ohio.

Warren D. Spengler, 73, a consulting civil engineer, died Nov. 11 in Denver. He was educated at Western Reserve University and Massachusetts Institute of Technology.

H. Webb Smith, president of Dick-Smith Engineering Corp., Hazleton, Pa., died Nov. 14. He formerly was associated with H. L. Stevens Co., Chicago hotel builders.

Theodore A. Shepard, 73, retired consulting and civil engineer who was a specialist in railroad bridge and tunnel construction, died Dec. 4 in New York. He invented an expansion joint that permits the addition of a second deck to bridges. He established the engineering firm of Shepard & Cure in New York City, and later served as consulting engineer with Simmonds Aerocessories, Inc., of Tarrytown, N. Y.

William C. Cram, Jr., 73, a construction engineer in the railroad and electric power field for many years, died Nov. 29 in Orlando, Fla. He was a graduate of Lehigh University and during his career worked with the L and N Railroad and Georgia Power Co.



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CONSTRUCTION REPORTS

Bids Asked—Low Bidders—Contracts Awarded—First Section—

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 36, N. Y., ELSIE EAVES, Manager
J. A. MAHONEY, M. O. WETZEL, L. M. WINISKI, M. E. SCIORRA, F. S. DEMBEK, Reports.
J. H. WEBBER, M. R. ROESSLER, E. R. HUBER, Statistics.

NEW ENGLAND

BIDS ASKED—HEAVY CONSTRUCTION

▲† **N. H., Portsmouth**—HANGARS—BA 1/7—U. S. Eng., 857 Commonwealth Ave., Boston, Mass., nine multi-purpose hangars, Portsmouth Air Force Base, ENG-19-016-55-62. $3,000,000-$3,500,000. Plans deposit $25. Luria Eng. Corp., 511 5th Ave., New York, N. Y., and Charles T. Main, Inc., 80 Federal St., Boston, Mass., engrs. CD 12/3.

BIDS ASKED—BUILDINGS

▲ **Conn., Middletown**—SCHOOL—BA 1/7—Town, Supt. Schools, Hunting Hill Ave., Woodrow Wilson High School, Hunting Hill Ave., east of present school. $1,200,000. Plans deposit $50. Guy F. Lamb, 252 Main St., archt. CD 2/9/53, under LB.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

MASSACHUSETTS—Commonwealth of Mass., Dpt. P. Wks., 100 Nashua St., Boston,
Continental Constr. Corp., 437 Main St., Lynnfield, Mass. LB $90,438, est. $69,000. hy. and bridge work, Water St., Danvers. Bids Dec. 14. CD 12/7.

▲† **Platt Constr. Co.**, 99 First St., Cambridge, Mass. CA, $1,323,000, est. $1,500,000-$1,750,000. Geological physics laboratory, Research Center Bldg. F, ENG-19-016-55-38, BEDFORD, MASS. U. S. Eng., 857 Commonwealth Ave., Boston, Mass. CD 11/23. under LB.

▲† **Theodore Loranger & Sons**, 404 Nash Rd., New Bedford, Mass. CA, $1,724,811, est. $2,500,000. aircraft aprons, warmup pad and aircraft refueling facilities, Otis Air Force Base, ENG-19-016-55-48, FALMOUTH, MASS. U. S. Eng., 857 Commonwealth Ave., Boston, Mass. CD 12/10, under LB.

MIDDLE ATLANTIC

BIDS ASKED—HEAVY CONSTRUCTION

NEW JERSEY—BA 1/11—New Jersey Turnpike Auth., Administration Bldg., New Brunswick,
Hudson Co.—Contract N-21, substructure for East Viaduct, extending from just west of Communipaw Ave. to just north of Grand St. in Jersey City. Plans deposit $15. Howard, Needles, Tammen & Bergendoff, 55 Liberty Ct., New York 5, N. Y., consult. engrs. CD 8/20/53, under Streets and Roads.

† **N. Y., Mitchel Field**—TRAINING CENTER—BA 1/13—U. S. Eng., 80 Lafayette St., New York, Zone 13, 400-man unit Army Training Center, FY 53. $100,-000-$500,000. Embury & Lucas, 150 E. 61 St., New York, Zone 22, archts. CD 12/15.

N. Y., Syracuse—BA 1/17—Robert W. Sollinger, County Purch. Agent, Onondaga P. Wks. Comn., for County Court House, Zone 2, exten. to Ley Creek Sanitary Sewer, Headsons Creek to Thompson Rd., Contr. No. 2, incl. constr. approx. 5,000 lin. ft. 24 and 27 in. diam. sanitary sewers, appurtenances incl. one highway crossing of the Court Street Rd. Plans deposit $10.

New York-New Jersey—BA 1/18—At office Chief Engineer of The Port of New York Auth., 111 8th Ave., New York 11, N. Y., Contr. LT-160.012, widening of the helix roadway from Hudson Co. Blvd. to Kings Bluff on approcah to Lincoln Tunnel in New Jersey. Plans deposit $30. CD 1/18, under Unclassified.

† **Md., Andrews Air Force Base**—OPERATION BLDG.—BA On Or About 1/27—U. S. Eng., First and Douglas Sts. N.W., Wash. 25, D. C., 2 story, 85x117 ft., rein.-con., masonry operation bldg., Andrews Air Force Base, ENG-49-080-55-32-(31). CD 10/1/51.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲† **Badgett Mine Stripping Corp.**, Box 347, Madisonville, Ky., LB $1,372,800, first project in the United States phase of the St. Lawrence Seaway, incl. removal of 3,880,000 cu. yd. earth from Richards Point, Croil Island and Long Sault Island sects. of Long Sault Canal, approx. 2½ mi. northwest of Massena, NEW YORK. U. S. Eng., Engineer Park, Niagara and Bridge Sts., Buffalo 7, N. Y. CD 11/3.

▲ **NEW YORK**—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Albany,
Rusciano & Son Corp. & Del Balso Constr. Corp., 728 E. 212 St., New York 67, N. Y., CA $6,409,804, est. $6,910,000. 2.95 mi. New England State Thruway-New England Sect. Subd. 6 (Cont. No. 1), FANETC. 54-4, Bronx Co.;
Herbert F. Darling, 131 California Dr., Williamsville, N. Y., CA $1,123,662, est. $1,174,000, 0.32 mi. Hy., 0.3 mi. Acc. City of Lockport; Genesee St.-Walnut St. FAC 54-10, Niagara Co. Bids Oct. 28, awarded Nov. 29. CD 11/3, under LB.

† **Albert Elia Building Co.**, 2749 Lockport Rd., Niagara Falls, N. Y., LB $156,462, training center and troop supply warehouse facility, Niagara Falls Air Force Base, Serial No. ENG-39-075-55-31, NIAGARA FALLS, N. Y. U. S. Eng., 80 Lafayette St., New York 13, N. Y. Bids Dec. 16. CD 11/24.

PENNSYLVANIA—State Hy. Dpt., 506 North Office Bldg., Harrisburg,
cancelled bids to have been opened Jan. 7, constr. substructure and superstructure 13 span-deck truss and plate girder bridge, two I-beam bridges and divided hy. (three schedules), T.R. 51-68-88-18, Rochester, Bridgewater and Beaver Boros, Beaver Co. CD 12/13.

John Matricciani Co., 408 S. Caroline St., Baltimore 2, Md. LB $222,883. Contr. 407-W, water main extens., Old Court Road Section, TOWSON, MD. Comrs. Baltimore Co., Court House, Towson, Md. Bids Dec. 9. CD 11/29.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Lawrence D Elkind**, c/o Stanley Shaftel, archt., 89-47 163 St., Jamaica, N. Y. Owner Builds. $2,000,000. 200 HOUSES, Manor Lane, off Sunrise Hy., BAY SHORE, N. Y.

▲ **Brightwaters Manor Homes**, c/o Stanley H. Klein, archt., 89-31 161 St., Jamaica, N. Y. Owner Builds. $3,750,000. 250 HOUSES, 140 acre tract, Montauk Hy. and Merrick Rd., BRIGHTWATERS, N. Y.

▲ **Planet Constr. Corp.**, 11 W. 42 St., New York 36, N. Y. CA $2,057,000, general constr. JUNIOR HIGH SCHOOL 67, Marathon Parkway and 62 Ave., Queens Boro, E-691, DOUGLASTON, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Nov. 19. CD 11/24, under LB.

▲ **Syndicate**, c/o Jacob Mark & Sons, 92-01 59 Ave., Elmhurst, N. Y. Owner Builds. $5,000,000. 325 HOUSES, 184-acre tract, Veterans Memorial Hy. and Town Line Rd., HAUPPAUGE, N. Y.

▲ **F. D. Rich Co., Inc.**, 322 Main St., Stamford, Conn. LB $2,542,000, infirmary bldgs., kitchen, etc. Bldgs. Nos. 73, 74, 75, Rome State School, ROME, N. Y. Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Albany, N. Y. Bids Dec. 16. CD 11/16.

▲ **Winthrop Park Homes**, c/o Alwin Cassens, Jr., archt., 145 S. Franklin Ave., Valley Stream, N. Y. Owner Builds. $3,000,000. 300 HOUSES, 75-acre tract on north side of Montauk Hy., east of Sayville Blvd., SAYVILLE, N. Y.

PROJECTS COVERED

By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterways $34,000; other public works $60,000; industrial buildings $82,000; other buildings $300,000. Also Foreign projects of $100,000 and more in size of interest to American contractors.

By Regions & Classes of Construction

(In order of Listing)

BIDS ASKED
LOW BIDDERS
CONTRACTS AWARDED

New England
Middle Atlantic
South
Middle West
West of Mississippi
Far West

PROPOSED WORK

Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Public Buildings
Mass Housing
Commercial Buildings
Industrial Buildings
Unclassified

In These Stages

PROPOSED WORK: Before and including appointment of engineers or architects.
BIDS ASKED: BA (new announcements only). For full calendar, see also preceding issues.
LOW BIDDERS: LB On jobs below $500,000 in value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.
CONTRACTS AWARDED: CA Except awards to low bidders previously reported in low bidder stage.
CD dates shown are of Construction Daily issue in which last previous report was published.

Symbols and Abbreviations Include:

† Federal Government
▲ Project of $1,000,000 or over.
ENR Engineering News-Record
CD Construction Daily

For additional reports see Construction Daily.

John S. Stubbs Co., Kensington, Md. LB $533,700. concrete, steel, masonry Elementary SCHOOL, 3 mi. south of HAGERSTOWN, MD. Bd. Educ., Washington Co., Court House, Hagerstown, Md. Chapman & Lefler, Hagerstown, Md., archts. CD 11/21/52.

▲ **Geo. Hyman Constr. Co.**, 1010 Vermont Ave. N.W., Wash., D. C. CA $3,000,000. 1 and 3 story, 150x278 ft., 120x430 ft., 120x170 ft. brick, concrete, steel SHOPPING CENTER and DEPARTMENT STORE, Langley Park, HYATTSVILLE, MD. Adelphi Inc., c/o James M. Gibson, 3415 Volta Place N.W., Wash., D. C. and Joshua Evans, Jr., 3405 Lowell St., Langley Park, Md. Abbott Merkt & Co., 10 E. 40 St., New York, N. Y., archts.

▲ **Standard Constr. Co.**, 1010 Vermont Ave. N.W., Wash., D. C., Owner Builds, $10,000,000. 455-unit APARTMENT HOUSE, 4000 Massachusetts Ave. N.W., WASH., D. C. Corning & Moore, 1726 M St. N.W., Wash., D. C., archts. CD 10/5.

SOUTH

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

VIRGINIA—Commonwealth of Va., Dpt. Hys., Central Highway Office Bldg., 1221 E. Broad St., Richmond,
Ralph E. Mills Co., Inc., P. O. Box 513, Salem, Va., LB $68,999, widening overpass and approach N. & W. R. R. in Rocky Mount, Rte. 220, St. Proj. 1833-24-26, Franklin Co. Bids Dec. 15. CD 11/29.

▲ **VIRGINIA**—Commonwealth of Va., Dpt. Hys., Central Highway Office Bldg., 1221 E. Broad St., Richmond,
Moore Brothers, P. O. Box 258, Verona, Va., LB $255,614, b. conc. 2.87 mi. Rtes. 340 and 522 from 2.28 mi. north of Shenandoah River to 1.29 mi. south of Warren-Clarke Co. line, St. Proj. 2693-04. Fed. Proj. F-498 (10), Warren Co.;

J. M. Glennon Constr. Co., 901 Kempsville Rd., Norfolk 2, Va., LB $163,419, soil aggregate, bit. surf. tr. 7.1 mi. Rte. 3, from Westmoreland-King George Co. line to 0.07 mi. east Int. Rte. 301, State Proj. 3348-05. Contr. No. 1, Fed. Proj. F-91 (2), King George Co.;

Ames & Webb, Inc., P. O. Box 4035, Norfolk 2, Va., LB $602,239, c. conc. pavement, bit. top 1.31 mi. Rte. 460-A, from 0.37 mi. S. Brambleton Ave. to 1.16 mi. N. Brambleton Ave. St. Proj. 7264-72. Fed. Proj. U-191 (1), Norfolk City;

Clyde R. Royals, Inc., 350 W. Pembroke Ave., Hampton, Va., LB $166,240, b. conc. 0.93 mi. Rte. 33, from 1.68 mi. north of NCL Richmond, to 0.28 mi. north of Int. 356 (Greendale), State Proj. 1943-09. Fed. Proj. F-480 (5), Henrico Co.;

Faulconer Constr. Co., P. O. Box 236, Charlottesville, Va., LB $328,026, b. conc. 2.3 mi. Rte. 60 from 1.98 mi. west of WCL Buena Vista to 0.04 mi. east of ECL Lexington, State Proj. 2181-03, Fed. Proj. F-387 (13), Rockbridge Co.;

T. E. Ritter Corp., 426 W. York St., Norfolk, Va., LB $320,429, c. conc. 3.19 mi. Rte. 13, 165, from 0.08 mi. south Int. Rtes. 13 and 165 to 0.19 mi. south Int. Rtes. 165 and 168 St. Proj. 1664-10; 7064-02; 7075-04, Group 4, Fed. Proj. F-563 (10), Norfolk and Princess Anne Counties. Bids Dec. 15. CD 11/29 and 12/3.

▲† **Brown-Coble Constr. Co.**, Lexington, N. C., LB $2,707,599, airfield paving;

Rea Constr. Co., Pineville Rd., Charlotte, N. C. LB $90,699, constr. road detour around one of roadway extens., Myrtle Beach Air Force Base, No. 38-081-55-16, MYRTLE BEACH, S. C. U. S. Eng., Custom House, Charleston, S. C. Bids Dec. 14. CD 11/23.

† **Henry Newton Co.**, Decatur, Ga., CA, $494,180 two-mile creek bridge, Buford Dam, Inv. CIVENG-01-076-32, GEORGIA, U. S. Eng., P. O. Box 1169, Mobile 7, Ala.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **The Lummas Co.**, 385 Madison Ave., New York, N. Y. CA Est. $2,500,000 design and construct 60-ton per day anhydrous ammonia PLANT, SOUTH CHARLESTON, W. VA. Food Machinery & Chemical Corp., Westvaco Chemical Div., South Charleston, W. Va. CD 7/6.

MIDDLE WEST

BIDS ASKED—HEAVY CONSTRUCTION

† **O., Lima**—FREIGHT ELEVATOR—BA 1/6—U. S. Eng., 237 Fourth Ave., Huntington 18, W. Va., furnishing, installing freight elevator for production bldg. at Lima Ordnance Depot, Serial No. ENG-46-022-55-11.

† **Wis., Oconto**—RIFLE RANGE—BA 1/10—U. S. Property Fiscal Office, Camp Douglas, rehabilitation and alterations to Oconto Rifle Range, Inv. 5.

(Continued on page 108)

May this be your merriest, most prosperous holiday season

There's a friendly smile on the frost-nipped face of America —the season of good cheer is with us once again! So we're taking this opportunity to extend greetings to you—the truck-users of the nation. Our wish for the New Year is that we may continue to serve you.

Season's Greetings from

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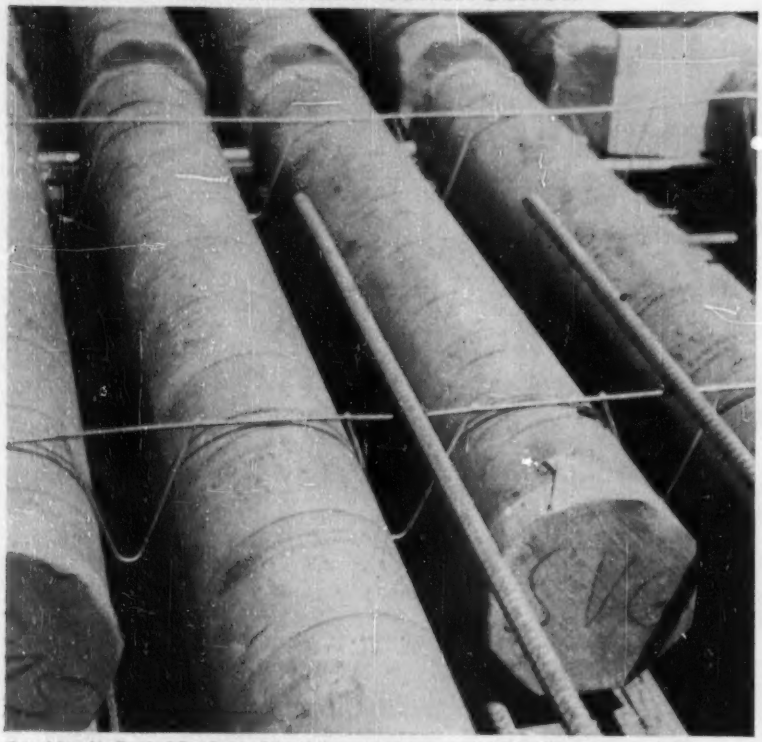

Central Assembly Church of God, Denver, Colo. R. D. Peterson, Architect; J. W. Sallada, Design Engineer; Jack Cys, Contractor

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Construction Products Division
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AKRON, IND. — BRANTFORD, ONT.

(Continued from page 106)

INDIANA—BA 1/12—Indiana Toll Road Comn., 309 W. Washington St., Indianapolis, Zone 4.

Lake Co.—Contract C-11/12, grading, drainage, structures, paving approx. 2.5 mi. Construction Section C-11/12 Indiana East-West Toll Road beginning at a point about 1,130 ft. east of Clay St. at Toll Road Centerline Station 1187 plus 00 and extending eastwardly to point adjacent to Burns Ditch at Toll Road Centerline Station 1321 plus 26. Plans deposit Standard Spec. for Indiana East-West Toll Road $5; Plans, Special Provisions and Proposal Forms, per set, per construction section $25. H. D. Hartman, ch. engr.; CD 12/10.

† Illinois—BA 1/18—U. S. Eng., 420 Locust St., St. Louis 2, Mo. Levees, Proj. VI-B, Clear Creek Drainage and Levee District, Union and Alexander Counties, CIVENG-23-065-55-36. Extended date. CD 12/14.

BIDS ASKED—BUILDINGS

▲ O., Columbus—FIELD HOUSE—BA 1/18—Ohio State University, N. High St., 200x400 ft. field house for indoor practice of track, baseball and football to be erected at west side of St. John sports arena. $1,200,000.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

† General Maintenance & Eng. Co., 1231 McKinley Ave., Columbus, O., CA, $71,295, repairs of valleys and roofs of Warehouses Nos. 11, 12 and 308, Columbus General Depot, COLUMBUS, O. Post Engineer Building No. 308, Columbus General Depot, U. S. Army, Columbus 15, O. CD 9/9/52, under Public Buildings.

▲ INDIANA—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis,

Peter Kiewit Sons Co. & Condon-Cunningham Co., 229½ W. Washington St., Indianapolis, Ind., LB, $3,994,031, Contract C-13 and C-14, Indiana East-West Toll Road in Porter Co. Bids Dec. 15. CD 11/22.

Moloney Plumbing & Heating Co., 6931 Calumet Ave., Hammond, Ind., CA, $573,445, 28,000 lin ft water mains in HAMMOND, IND. City, City Hall, Hammond, Ind. Bids Nov. 15, awarded Dec. 14. CD 11/5.

Marion Castellano, Marion, Ill. Owner Builds, $100,000. 500 car drive-in motion picture theatre, on Hy. 37, 1½ mi. north of MARION, ILL.

† Powers-Thompson Constr. Co., 27 South Chicago St., Joliet, Ill., CA, $61,925, rehabilitation of SAC supports and new pavement acid area, No. 3, Kankakee Unit, Serial No. ENG-11-032-55-16, JOLIET, ILL. U. S. Eng., 475 Merchandise Mart, Chicago 54, Ill. Bids Oct. 15. CD 10/6.

BUILDINGS

LOW BIDS AND CONTRACTS

G. W. Atkinson & Son, 525 E. Hudson St., Columbus, O. CA, $131,250, general constr., Antenna Research LABORATORY, COLUMBUS, O. Ohio State University, N. High St., Columbus, O. CD 9/15.

Johnson Plumbing & Heating Co., 2740 Nebraska St., Toledo, O., CA, $88,804, alterations and changes in BOILER ROOM at Waite High School, TOLEDO, O. Bd. Educ., 121 Southard Ave., Toledo, O. Bids Nov. 22, awarded Dec. 13.

Urban Builders, Nassau, Wis., CA, 1 story 85x250 ft., steel, brick, blocks WAREHOUSE, WISCONSIN RAPIDS, WIS. Preway, Inc., Wisconsin Rapids, Wis.

WEST OF MISSISSIPPI

BIDS ASKED—HEAVY CONSTRUCTION

Mo., St. Louis—SPRINKLER SYSTEM—BA 1/18—Bd. Public Service, Frank J. McDevitt, pres., 305 City Hall, automatic sprinkler sys. to be installed on various bldgs. and proposed new storage bldg. at City Infirmary and City Infirmary Hospital, $136,000. CD 4/26/43, under Public Buildings.

† S. D., Rapid City—STORAGE AMMO BLDG.—BA 1/19—U. S. Eng., 1709 Jackson St., Omaha, Neb., storage ammo bldg. and igloos, Ellsworth Air Force Base, Inv. 25-066-55-47. CD 12/15.

† Ark., Blytheville—WAREHOUSE—BA About 1/20—U. S. Eng., P. O. Box 867, Little Rock, warehouse, Blytheville Air Force Base, Serial No. ENG-03-050-55-65. CD 12/1/53.

BIDS ASKED—BUILDINGS

Mo., Troy—SCHOOL—BA 1/12—Bd. Educ., Reorganized School Dist. No. 111, Lincoln Co., Fred Dreyzehner, pres., Troy 1 and 2 story high school, part of elementary school in Troy; addns., alterations to schools at Moscow Mills. Ernest T. Friton, 410 Security Bldg., St. Louis, Zone 2, archt. CD 6/14.

Neb., Norfolk—ARMORY—BA 1/21—Nebraska National Guard, Capitol, Lincoln and City of Norfolk, Norfolk, armory. $150,000.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

Orfei & Mariani, 1156 Homer St., St. Paul, Minn. LB $813,198. constr. Northwest Diagonal, Trunk Sewer Imprvt. to No. 69, EDINA (P. O. MINNEAPOLIS), MINN. Village, E. C. Baik, clk., Edina, Minn. Bids Dec. 13. CD 11/23.

† Hardwick Bros. Constr. Co., First State Bank Bldg., Beardstown, Ill., CA, $188,701, Item 89-N, Rob Roy enlargement, on north bank of Arkansas River in Jefferson Co., ARKANSAS, U. S. Eng., P. O. Box 60, Vicksburg, Miss. Bids Nov. 2. CD 10/14.

† U. S. Eng., P. O. Box 867, Little Rock, Ark., cancelled bids to have been opened Dec. 20, fuel storage road and warehouse road, ENG-03-050-55-58, CD 12/7; cancelled bids to have been opened Dec. 22,

fuel storage, jet and diesel tanks and pumps, truck and rail facilities, Blytheville Air Force Base, ENG-030-50-55-64, CD 12/7, BLYTHEVILLE, ARK.

▲† **Pierre Constructors** (Russ Mitchell, Inc., 5304 Old Spanish Trail, Houston, Tex., W. A. Smith Contg. Co., Inc., 1401 Fairfax Trafficway, Kansas City, Mo., and Bruce Constr. Co., Fort Worth, Tex.). CA **$4,792,636**, outlet works, Stage II, Oahe Reservoir, CIVENG 25-066-55-40, SOUTH DAKOTA. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids Nov. 23. CD 11/29, under LB.

Villa Ranchaero Shopping Center, Rapid City, S. D. rejected bids Nov. 1, furnish, install water sys. incl. drilling well, install pump, etc., RAPID CITY, S. D. LB **$39,902**. CD 11/17, under LB.

† **E. H. Holtzen**, Enid, Okla., LB **$127,433**, est. $125,-000-$375,000, Inv. No. 14-55, floodwaters retarding structures, 232,000 cu. yd. embankment, 82,000 yd., excav., clearing and grubbing, 24,000 yd. spillway soil, etc., near Clinton, Custer Co.; LB **$77,-613**, est. $100,000. Inv. No. 18-55, floodwater retarding structures, Barnitz Creek of Washita River Watershed, near Leedey, Dewey Co. OKLAHOMA. Soil Conservation Service, Dpt. Agriculture, Box 1377, Oklahoma City, Okla. Bid Dec. 6. CD 11/22.

W. H. Smith, Wilson, Okla., CA **$48,213**, est. $60,000, labor contract for laying 11 mi. pipe lines;

Wilter Drilling Co., Hillsdale, Okla., CA **$39,300**, est. $50,000, drilling 30 shallow water wells, PONCA CITY, OKLA. City, Ponca City, Okla. R. D. Alexander, Globe Life Bldg., Oklahoma City, Okla. engr. Awarded Dec. 10.

Bellaire Lumber Co., 7903 S. Flores St., San Antonio, Tex., Own Forces. **$35,000**, c.i. water lines in Morningside Park, SAN ANTONIO, TEX. CD 11/26.

FAR WEST

BIDS ASKED—HEAVY CONSTRUCTION

† **Wash., Spokane**—RUNWAY—BA 1/14—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, lengthen runway, Fairchild Air Force Base, Inv. 55-86. Extended date. Plans deposit $25. CD 12/6.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Certified Homes, Inc.**, 6535 Wilshire Blvd., Los Angeles, Calif, Owner Builds, **$1,116,700**, 114 frame, stucco DWELLINGS, Domart, Flatbush and Mapledale Sts., BELLFLOWER, CALIF. David Freedman, 407 Commercial Center, Beverly Hills, Calif., archt.

Norman C. Toombs, 2216 Monte Vista St., Pasadena, Calif., LB, **$336,450**, La Fetra SCHOOL Addn., GLENDORA, CALIF. Glendora School District, 440 W. Foothill Blvd., Glendora, Calif. Bids Dec. 9.,

Baruch Corp., 321 S. San Vicente Blvd., Los Angeles, Calif., CA, **$561,000** 51 frame, stucco DWELLINGS, Foxton, Kettering and Raystack Ave., LANCASTER, CALIF. Magnolia Downs, Inc., 321 S. San Vicente Blvd., Los Angeles, Calif. Paul J. Duncan, 13310 Moorpark St., Sherman Oaks, archts.

▲ **Bechtel Corp.**, 4620 Seville Ave., Vernon, Calif., CA **$24,000,000** design and construct 156,000 kw, Alamitos steam-electric GENERATING STATION, LONG BEACH, CALIF. Southern California Edison Co., 601 W. 5 St., Los Angeles, Calif.

Ford J. Twaits Co., 449 S. Beaudry St., Los Angeles, Calif., CA, **$950,000**, 1 story, 33,800 sq. ft., steel frame OFFICE, LOS ANGELES, CALIF. Blue Cross Hospital Service of Southern Calif., 3443 Wilshire Blvd., Los Angeles, Calif. Awarded Dec. 13. CD 7/23.

Davies, Keusder & Brown, 4915 Exposition Blvd., Los Angeles, Calif., LB, **$174,940**, foundations for county COURT HOUSE, 1 and Hill Sts., LOS ANGELES, CALIF. Los Angeles Co., Hall of Records, Los Angeles, Calif. Bids Dec. 10. CD 11/19.

Kenbo Corp., 1397 S. Garfield Ave., Monterey Park, Calif., Owner Builds, **$329,400**, 32 frame, stucco DWELLINGS, Bradshaw St., Tract 19610, MONTEREY PARK, CALIF. Burge & Roach, 510 Knights Way, La Canada, Calif., archts.

Ontario Homes, 11741 Barrington Ct., Los Angeles, Calif. Owner Builds, **$331,500**, 39 frame, stucco DWELLINGS, Tract 1995, ONTARIO, CALIF.

Irby Bldg. Co., 150 S. Flower St., Santa Ana, Calif., Owner Builds, **$892,400**, 97 frame, stucco DWELLINGS, Palm, Sycamore, Beaton Way and other streets, ORANGE, CALIF. Davis & Quigley, 314 W. 17 St., Santa Ana., archts.

B. R. S. Development Co., 5654 W. 3 St., Los Angeles, Calif., CA, **$968,000**, 88 frame, stucco DWELLINGS, Jackman, Cork and Lashburn Sts., SAN FERNANDO, CALIF. La Cienega Homes, 5654 W. 3 St., Los Angeles, Calif.

CANADA

BIDS ASKED—HEAVY CONSTRUCTION

Ont., Port Colborne—BA 1/10—Town, D. M. Peart, clk., Town Hall, East Side Sewage Treatment Plant addn. $100,000. Phillips & Roberts, 63 John St. S., Hamilton, engrs. J. R. Scott, 115 Main St., engr. CD 11/24/43.

BIDS ASKED—BUILDINGS

Ont., Petawawa—GENERATING UNITS—BA 1/11—Dpt. National Defence, ARMY, Ottawa, Ont. supply, installation two 65,000 hp. steam generation units. Extended date. CD 12/1.

Ont., Petawawa—GARAGES—BA 1/11—Dpt. National Defence, ARMY, Ottawa, Ont., three 40-vehicle unit Garages, etc. CD 12/15.

Que., Valcartier—QUARTERS—BA 1/11—Dpt. National Defence, ARMY, Ottawa, Ont., sergeants and officers

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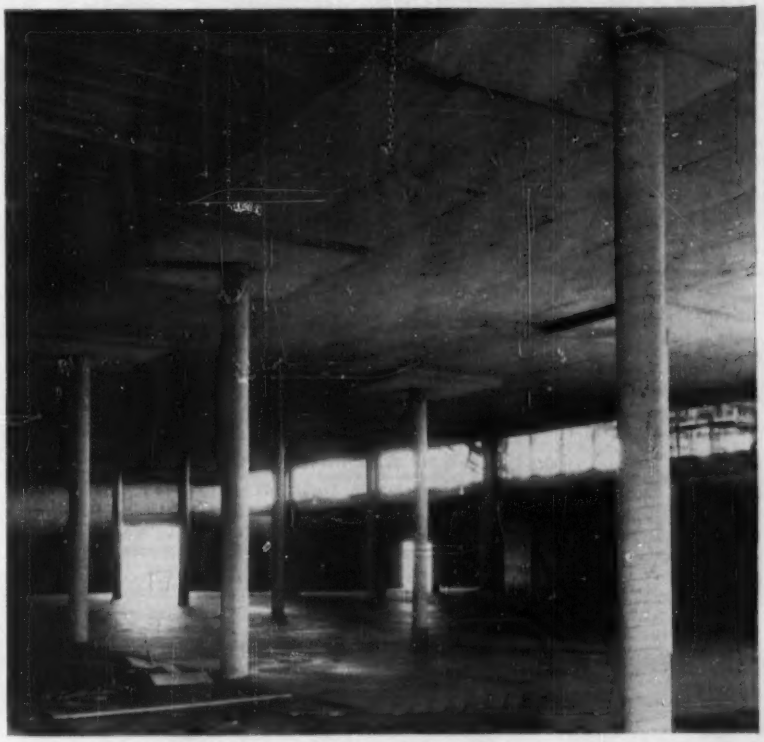

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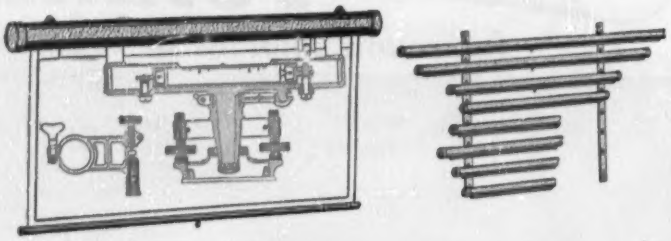

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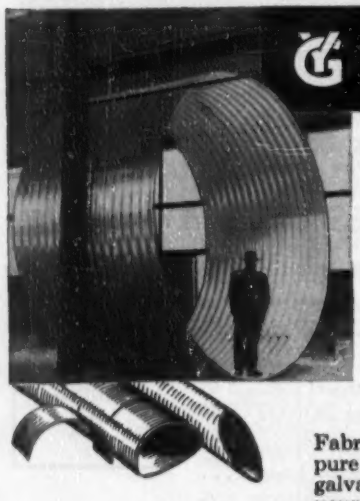

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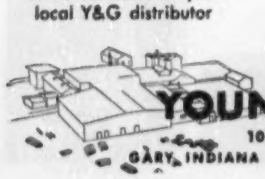

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quarters, Extended date. Defence Constr. (1951) Ltd. 56 Lyon St., Ottawa, engrs. CD 11/30.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

Poole Constr. Co. Ltd., 10503 109 St., Edmonton, Alta., CA, $249,950, sewage pumping station and river intake structure, north bank of Saskatchewan River, EDMONTON, ALTA. City, City Hall, Edmonton, Alta. CD 10/21/53. Awarded Dec. 9.

Henry Borger & Son, Ltd., 590 Pembina Hy., Winnipeg, Man., CA, $116,091, flood pumping station, Cockburn St., WINNIPEG, MAN. City, City Hall, Winnipeg, Man. Awarded Dec. 9.

ONTARIO—Dpt. Hys., Parliament Bldgs., Toronto,
Schwenger Constr. Ltd., 1255 Beach Rd., Hamilton, Ont., CA, $142,533, Don Mills Road Overpass on Hy. 401 northern end of Toronto;

Canada Grading & Structures Ltd., 419 Cherry St., Toronto, Ont., CA, $126,597, overpass on Hy. 401 at Conlin's Rd. in northern end of Toronto;

Hi-Way Constr. Ltd., Norfolk St. S., Simcoe, Ont., CA, $495,974, railway overhead and concrete arch, Hy. 122 in Trafalgar Twp.;

R. A. Blyth Constr. Co., 7 St. Andrews Gardens, Toronto, Ont., CA $68,375. bridge on Hy. 115 near Newcastle. Grand total, $833,479. Awarded Dec. 10.

ONTARIO—Dpt. Hys., Parliament Bldgs., Toronto,
Swansea Constr. Co., 363 Rogers Rd., Toronto, Ont., LB, $471,107, concrete base and hot mix paving 3 mi. Hy. 11, north of Toronto city limits, from Mausoleum to Steele Corners, Toronto. CD 4/27/44.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **C. T. Lount Constr. Co., Ltd.**, McGillivray Blvd., Winnipeg, Man. Owner Builds, $3,500,000. HOUSING, ST. BONIFACE, MAN.

Malcolm Constr. Co. Ltd., 554 Pembina Hy., Winnipeg, Man., CA, $250,000. 1 story, 150x200 ft. STORAGE, Berry St. and Sargent Ave., WINNIPEG, MAN. Firestone Tire & Rubber Co. of Canada, 133 Market Ave. East, Winnipeg, Man. Smith-Carter-Katelnikoff, Trust & Loan Bldg., Winnipeg, Man., archts. Awarded Dec. 10.

Finley W. McLachlan Ltd., 195 Fairbank Ave., Toronto, Ont., CA, $500,000, 1 story 210x300 ft., steel brick FACTORY, plus OFFICE section, Warden Ave. and Upton Rd., TORONTO, ONT. F. C. Russell Co. of Canada Ltd., 2001 Eglinton Ave. E., Toronto, Ont. Awarded Dec. 10.

▲ **Foundation Co. of Canada Ltd.**, 1900 Sherbroke St. W., Montreal, Que., CA $15,000,000. sulphate pulp PLANT EXPANSION, LA TUQUE, QUE. Canadian International Paper Co., Sun Life Bldg., Montreal, Que.

▲ **Geo. A. Fuller Co.**, 597 Madison Ave., New York, N. Y., CA $5,000,000. SHOPPING CENTER, Taschereau Blvd. near Alfred St., Greenfield Park, MONTREAL, QUE. Syndicate, c/o contractor.

ALASKA

BIDS ASKED—BUILDINGS

† **Alaska, Valdez**—HOSPITAL—BA 1/19—Alaska P. Wks., Dpt. Interior, 123 Third St., Juneau, 1 story, 10,500 sq. ft. masonry hospital, rein.-con. fdn. $460,000. CD 9/17.

Proposed Projects

WATER SUPPLY

Okla., Guthrie—City, voted bonds, water treatment plant, $193,000. C. E. Bretz, 1916 North Broadway, Oklahoma City, Okla., consult. engr.

Tex., Bowie—City, c/o S. L. Greenwood, mayor, reservoir, water supply line, filter plant, $700,000. Freese & Nichols, 407 Danciger Bldg., Fort Worth, consult. engrs.

▲ **Tex., Crockett** — Houston County Water Control & Imprvt. Dist., Crockett, dam for domestic water and industry supply on Little Elkhart Creek, holding 15,000-acre ft. water, yield 9,000,000 cu. ft. water daily to be known as "Little Elkhart Creek" site, $860,000; dam for domestic water and industrial supply, impounding 11,600 acre ft. water, yield 15,000,000 gal. water daily to be known as "Big Elkhart Creek," $1,250,000. J. M. Lloyd & Assocs., Littlefield Bldg., Austin, consult. engrs. CD 8/24.

▲ **Tex., Lufkin and Nacogdoches**—Angelina and Nacogdoches Counties Water Control & Imprvs. Dist. No. 1, Lufkin, voted bonds, water reservoir and dam Lake Ponta, Lufkin-Nacogdoches, $13,375,000; water main or conduit, from reservoir to dam to city limits, Lufkin, $750,000; water main conduit from reservoir and dam to city limits, Nacogdoches, $875,000; water pumping station, Lufkin-Nacogdoches, $1,000,000. CD 11/24.

▲ **Tex., Wichita Falls**—City, voted $3,000,000 bonds Dec. 14, water main addns., etc.

▲ **Alaska, Anchorage**—City, City Hall, filtration plant, $1,800,000. Stevens & Thompson, Spalding Bldg., Portland, Ore. and Alenar, Associated, Anchorage, consult. engrs. CD 10/13.

SEWERS, WASTE DISPOSAL

▲ **Conn., Ansonia, Derby, Shelton**—Cities of Ansonia, Derby and Shelton, City Hall, Ansonia, sewage disposal plant. $2,300,000. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., survey engrs. CD 3/7/50.

(Continued on page 112)

Greater Economy...

More Versatility in Street or Highway

STAGE CONSTRUCTION with a SEAMAN MIXER

Low cost stabilization of native soils with the SEAMAN Self-Propelled Mixer.

STAGE 1. To improve a light traffic county or township road . . . or to make streets in new subdivisions, the SEAMAN MIXER will mix and blend the native soils already in place. This achieves a uniform soil reaction to moisture and provides a smooth, weather-durable base. Construction costs and maintenance are low.

A "black earth" road stabilized at low cost by mixing in 0.5 gallons of oil per inch of depth with the SEAMAN MIXER.

STAGE 2. Next year? Or the next? As traffic grows heavier, scarify the old stabilized base and utilize your SEAMAN to mix in any suitable fluid or dry additive. The SEAMAN MIXER provides the most thorough, uniform distibution of binder and the highest densities after compaction.

A gravel highway with excellent load-bearing and weather resistant characteristics by correct assembly of materials with the SEAMAN MIXER.

STAGE 3. Traffic flow and weight increasing? Now lay gravel or crushed stone on the Stage 2 suface and mix it with the PULVI-MIXER.

Thus you take advantage of the thickness of the previously stabilized base — moreover, with the SEAMAN you correct segregation in the new aggregate by blending the coarse and fines, interlocking and mortaring-in the stone in the most efficient *assembly* of those materials.

High type of gravel-asphalt stabilized for a city street. SEAMAN TRAV-L-PLANT is mixing, blending and properly assembling materials for maximum density.

STAGE 4. When traffic volume demands, scarification of the gravel-stabilized course and re-mixing with bituminous binder or cement provides the community with a high type of heavy duty, low upkeep pavement. And it is achieved at a minimum of cost because you have re-used the aggregate already in place.

Properly assembled materials resist wear by traffic. Only the SEAMAN MIXER properly mixes, blends and assembles the coarse and the fines to build a base which is highly durable, resistant to penetration and break-up from frost. And only with the SEAMAN can you accomplish this within the limits of the most modest budget.

The SEAMAN TRAV-L-PLANT 7 ft. mixing width, gasoline or diesel powered. Equipped with pump, tachometer controls, volumetric meter and spray bar for admixture of bituminous materials or water.

The principle of SEAMAN mixing, together with a complete description of the SEAMAN MIXERS is shown in this recently issued Bulletin. Many job scenes illustrate the text. Write for Bulletin TPS.

SEAMAN MOTORS Inc.

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(Continued from page 110)

▲ N. C., Raleigh—City, W. H. Carper, mgr., sewage treatment plant, on Walnut Creek, $2,100,000, Wm. Olsen & Assoc. 5 Exchange Place, Raleigh, consult. engrs. CD 7/27.

▲ Va., Arlington—Arlington Co., Court House, incinerator addn., $980,000; storm water drains on Four Mile Run, $200,000. CD 11/6/53.

▲ Alaska, Cordova—Town, Town Hall, voted bonds Dec. 8, sanitary sewers, water mains, fire hydrants, sidewalks, curbs, gutters and trestle rehabilitation. $2,350,000. CD 3/3/50.

BRIDGES

ARKANSAS—State Hy. Comn., Little Rock,
Clay Co.—bridge over Black River U. S. Hy. 62, $605,000.
Conway Co.—new floor on bridge over Arkansas River, State Hy. 9, Morrilton, $48,000. CD 12/24/43.

▲ Wash., Spokane—City, City Hall, bridge over Spokane River, $4,600,000. Tudor Engr. Co., 74 N. Montgomery St., San Francisco, Calif., Kenneth P. Norrie & Assoc., Realty Bldg., Spokane, consult. engrs. Coverdale & Colpitts, engrs., 120 Wall St., New York, N. Y., made traffic survey. CD 6/13/52.

STREETS AND ROADS

▲ CONNECTICUT—State Hy. Comn., G. Albert Hill, comr., State Office Bldg., Hartford,
Newington—relocating 4-lane divided hy. between Corbins Corner, W. Hartford and Newington to point west of Cedar St. Route 71, $700,000;
West Hartford—2 East West Highways $2,000,000. Wilbur Smith Assoc., 265 Church St. New Haven, traffic engr.

Tex., Edinburg—City, street paving and imprvs. $620,000. Sigler, Clark & Winston, Box 428, Weslaco, and Chas. O. Meldon, 303 S. Closner St., Edinburg, consult. engrs. CD 12/14.

EARTHWORK, WATERWAYS

▲ Calif., Oakland—Alameda Flood Control & Water Conservation Dist., Court House, defeated $3,987,000 bonds, flood control work in Zone 5. CD 11/9.

AIRPORTS

▲† Mont., Glasgow—AIRPORT IMPRVS.—U. S. Eng., City-County Airport, Walla Walla, Wash., bulk storage for jet gas, $75,000; airfield lighting, approach and runway, $100,000; base facilities, $3,500,000.

▲† Alaska, Bethel—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000. CD 3/9/53.

▲† Alaska, Chiniak—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲† Alaska, Gulkana—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲† Alaska, Homer—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲† Alaska, Kotzebue—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲† Alaska, Sitkinak—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲† Alaska, Unalakleet—FACILITIES—U. S. Eng., Anchorage, facilities at Air Force Station. $1,000,000.

▲ Alta., Calgary—HANGAR—City, City Hall, reconstr. hangar, Municipal Airport. $1,700,000. CD 6/21/46.

Que., St. John's—HANGAR—Dpt. Defence, Ottawa, Ont., reconstr. hangar. $1,300,000. Aircraft Industries Ltd., Lessee.

PUBLIC BUILDINGS

Calif., Costa Mesa—SCHOOL FACILITIES—Costa Mesa Elementary School District, Costa Mesa, $875,000 bond election Feb. 8, schools.

▲ Calif., Daly City—SCHOOLS—Jefferson Elementary School District, Daly City, voted $1,486,000 bonds schools. CD 10/21.

▲ Calif., Los Angeles—STEAM ELECTRIC GENERATING PLANT—Los Angeles Dpt. Water Power, 207 S. Broadway, steam-electric generating plant at Pacific Coast Hy. and Anaheim Rd., Long Beach, $85,000,000. S. B. Morris, c/o owner, engr.

▲ Calif., Novato—SCHOOLS—Novato Union Elementary School District, 925 Grant Ave., voted $550,000 bonds, 2 elementary schools, high school and elementary school addn. etc. $2,000,000. CD 10/14.

▲ Calif., Petaluma—SCHOOLS—Petaluma City High School Dist. Sonoma Co., Petaluma, voted $1,750,000 bonds, schools. CD 10/21.

▲ Calif., Porterville—COLLEGE, etc.—Porterville High School & College District, Porterville, $1,800,000 bond election Feb. 8, Porterville College and remodeling high school. CD 5/2/50.

▲ Calif., Redwood City — SCHOOLS — Sequoia Union High School District, Broadway and El Camino Real, defeated $6,250,000 bonds, schools. CD 10/11.

▲ Calif., San Francisco—WORLD TRADE CENTER—World Trade Center Auth., Bd. State Harbor Comrs., Ferry Bldg., plans by Wm. Merchant, 57 Post St., world trade center, at Ferry Bldg. $2,000,000. CD 3/29.

(Continued on page 114)

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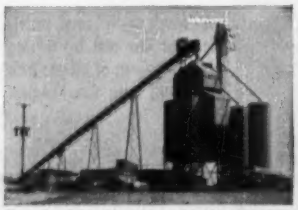

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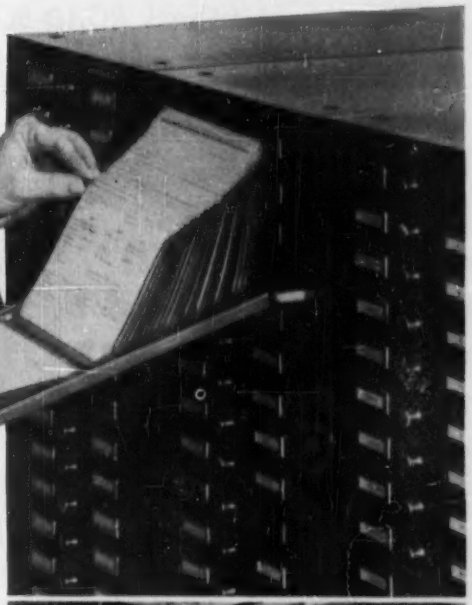

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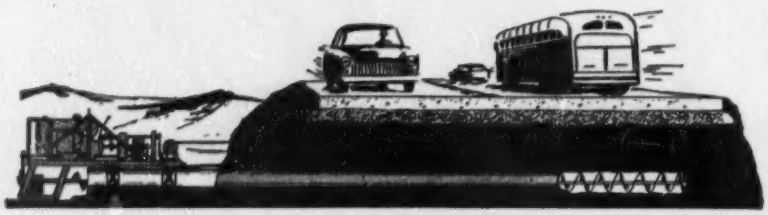

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(Continued from page 112)

▲ **Calif., Stockton**—SCHOOLS—Bd. Educ., 324 N. San Joaquin St., voted $7,750,000 bonds, schools. CD 8/25.

▲ **Colo., Adams City**—SCHOOLS—School District No. 14, Adams Co., Adams City, voted $2,000,000 bonds schools. CD 11/29.

▲ **Ill., Joliet**—SCHOOL—Bd. Educ., 153 S. Ottawa St., plans by Skidmore, Owings & Merrill, 100 W. Monroe St., Chicago, Zone 3, Junior High School $1,200,000. Levon Seron, 81 N. Chicago St., assoc. archt.

▲ **Kan., McPherson** — POWER PLANT — City, power plant exten., imprvs. $1,175,000.

Me., Biddeford—SCHOOL—City, 205 Main St., elementary school. $600,000.

Md., Baltimore—SCHOOL—Bd. Educ., 5 E. 25 St., Zone 18, plans by Tyler, Ketcham & Meyers, 513 Park Ave., Zone 1, Cherry Hill Elementary School. $750,000. R.E.L. Williams, c/o owner, bldg. constr. engr. CD 11/9.

▲ **Md., Baltimore**—HEALTH—City, Health Dpt., 410 Municipal Bldg., Zone 2, plans by Gaudreau & Gaudreau, 324 N. Charles St., Zone 1, Western Health Bldg. $1,000,000. R.E.L. Williams, c/o owner, bldg. constr. engr. CD 11/9.

▲ **Md., Baltimore**—POLICE—City, Police Dpt., Baltimore, Zone 2, plans by Finney, Wolcott & Assoc., 320 W. 24 St., Zone 18, 6 police bldgs. $3,000,000, R. E. L. Williams, c/o owner, bldg. constr. engr. CD 11/9.

▲ **Mich., Big Rapids**—EDUCATIONAL UNIT, etc.—State, Ferris Institute, Victor Spathelf, pres., Big Rapids, health and physical education unit. $1,000,000; classroom bldg., $750,000; trade center bldg., $850,000; dormitory, incl. food services, $1,000,000.

▲ **Mich., Royal Oak**—SCHOOLS—City, Gladys Holmes, clk., Mark Twain School addn., $300,000; plans by O'Dell, Hewlett & Luckenbach, 950 N. Hunter Blvd., Birmingham, high school, $4,000,000; elementary school, $500,000; 2 elementary schools, $500,000. CD 5/19.

Minn., Renville—SCHOOL—Bd. Educ., J. H. Smith, clk., voted $550,000 bonds Nov. 23, school addn. $500,000. Pass & Rockey, Mankato, archts. CD 11/10.

▲ **N. J., Boonton**—SCHOOL, etc.—Bd. Educ. plans by Emil A. Schmidlin, 586 Central Ave., East Orange, John Hill School addn., conversion of present high school into elementary school. $1,000,000. CD 5/17/46.

† **N. J., Newark**—TRAINING CENTER—U. S. Eng., 80 Lafayette St., New York 13, N. Y., plans by Production Engineering, 585 Main St., East Orange. 1,000 man unit, Army Training Center, FY-53, $500,000-$1,000,000. CD 7/25/52.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-32, Crown Heights Branch, Brooklyn Public Library, vicinity Empire Blvd. and Rogers Ave. $606,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-33, Tompkins Park Branch, Brooklyn Public Library. $590,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-79, Bay Ridge Branch, Brooklyn Public Library, Ridge Blvd. and 73 St. $547,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-82, Eastern Parkway Branch, Brooklyn Public Library, $958,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-94, New Lots (East New York) Branch, Brooklyn Public Library, New Lots Ave., Barbey St. and Schenck Ave. $754,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-95, Flatlands Branch, Brooklyn Public Library, $640,000. CD 2/14/45.

N. Y., Brooklyn—LIBRARY—Dpt. P. Wks., Municipal Bldg., New York, Zone 7, Proj. L-96, Rugby Branch, Brooklyn Public Library, vicinity of Utica and Church Aves. $604,000. CD 2/14/45.

▲ **N. Y., Brooklyn**—SCHOOL—Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City, Zone 1, Proj. E-670, P. S. 84, Glenmore Ave. and Osborne St., $1,800,000. CD 9/8/49.

▲ **N. Y., New Brighton**—SCHOOL—Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City, Zone 1, Proj. E-173, P. S. 17. $1,500,000. CD 10/8/48.

▲ **N. Y., New York**—HOSPITAL—Dpt. P. Wks., The Governor Alfred E. Smith State Office Bldg., Albany, plans by Urbahn, Brayton & Burrows, 654 Madison Ave., New York, Zone 21, mental hospital on 124-acre tract on Hutchinson River Parkway. $45,000,000. CD 7/27.

N. Y., Tompkinsville—SCHOOL—Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City, Zone 1, Proj. E-182, P. S. 16 addn. $850,000. CD 10/8/48.

N. Y., Tompkinsville—SCHOOL—Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City, Zone 1, Proj. E-231, P. S. 15. $930,000. CD 10/8/48.

▲ **N. C., Marion**—SCHOOLS—Bd. Co. Comrs., McDowell Co., Marion, voted $1,000,000 bonds Dec. 7, city-county schools.

▲ **O., Toledo**—SCHOOLS—Bd. Educ., Washington Twp. School Dist., 5700 Whitmer Rd., plans by McLaughlin & Keil, Lima, new grade schools in Lincolnshire area, Monroe Acres Dist., and in Rowland Road Area; plans by Hahn & Hayes, 723 Adams St., remodeling and addns. to Whitmer High School and Trilby and Shoreland Grade Schools. $1,850,000. CD 11/8.

(Continued on page 116)

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(Continued from page 114)

▲ **Pa., Rimersburg**—HIGH SCHOOL—Union Joint Schools, Rimersburg, plans by Walter F. Ritterhouse, Kittanning, 1 story, brick, block, steel Senior High School. $1,500,000.

Pa., Westtown—SCHOOL—Westtown-Thornbury Joint School Bd., Westtown, plans by Davis Poole & Sloane, 112 S. 16 St., Phila., elementary school. $500,000. Charles H. Wolfe, Blue Cross Bldg., Phila., engr. CD 8/27.

▲ **Tex., Dallas**—SCHOOLS—Dallas Independent School Dist., 3700 Ross St., voted bonds Dec. 11,
East Dallas High School, $2,600,000.
Pleasant Grove area High School, $1,750,000.
high school in Southwest Oak Cliff, at Gibb Williams Rd. and Westmoreland, $1,950,000.
No. 1, Junior High School, $1,000,000.
No. 2, Junior High School, $2,100,000.
No. 3, Junior High School, $1,250,000.
No. 4, Junior High School, $1,500,000.
No. 5, Junior High School, $1,750,000.
No. 6, Junior High School, $1,850,000.
No. 1, elementary school, $750,000.
No. 2, elementary school, $900,000.
No. 3, elementary school, $550,000.
No. 4, elementary school, $800,000.
No. 5, elementary school, $625,000.
No. 6, elementary school, $825,000.
No. 7, elementary school, $850,000.
No. 8, elementary school, $675,000.
No. 9, elementary school, $950,000.
No. 10, elementary school, $775,000.
No. 11, elementary school, $500,000.
No. 12, elementary school, $875,000.
No. 13, elementary school, $535,000.
No. 14, elementary school, $890,000.
No. 15, elementary school, $925,000.
No. 16, elementary school, $1,000,000.
No. 17, elementary school, $1,250,000.
No. 18, elementary school, $975,000. CD 12/1.

▲ **Tex., El Paso**—CITY-COUNTY, etc.—City of El Paso, Fred Harvey, mayor, and El Paso Co., H. McGovern, Jr., judge, El Paso, voted bonds, two 8-story new wings City-County Bldg., and remodeling 4 story jail. $3,000,000. Monroe, Licht & Higgins, 827 E. Yandell Blvd., archts. Landauer & Shafer, 4801 Lemmon St., Dallas, consult. engrs. CD 6/11/53.

Tex., Grapeland—HIGH SCHOOL—Grapeland Independent School Dist., Grapeland, plans by John Chiles Allen, 510 Atlanta St., Austin, 1,150 student capacity high school. $875,000.

Tex., Uvalde—SCHOOL—Uvalde Independent School Dist., Uvalde, plans by Harvey P. Smith Assocs., 117 El Pardo Dr., San Antonio, school. $500,000.

Va., Warwick—HIGH SCHOOL—City School Bd., 118 Main St., plans by Samuel N. Mayo, 1900 W. Broad St., Richmond, Carver High School addn. $500,000.

Wash., Rochester—SCHOOL—School Bd. District 401, Rochester, bond election Jan. 5, high school $500,000. Johnson & Botesch, First Natl. Bank Bldg., Everett, archts. CD 11/29.

Alta., Edmonton—KITCHENS, DINING ROOMS—City, City Hall, plans by Rule, Wyn & Rule, 11422 Jasper Ave., constr. Alexandra hospital's kitchens and dining rooms, addns., alterations, $750,000. CD 11/10/50.

▲ **B. C., Haney**—CORRECTION INSTITUTE—B. C. Govt., Douglas Bldg., Victoria, plans by C. Campbell, Douglas Bldg., Victoria, rein.-con. correction institute for boys, $2,750,000.

N. S., Dartmouth—OFFICERS QUARTERS—Defence Constr. Ltd., 56 Lyon St., Ottawa, Ont., plans by Fetherstonhaugh, Dunford, Bolton & Chadwick, 1411 Crescent St., Montreal, Que., officer's quarters, Naval Depot, $700,000.

▲ **Ont., Chatham**—HOME FOR AGED—City, T. M. S. Kingston, engr. electors have approved, home for aged. $1,500,000.

▲ **Ont., Hamilton**—HOSPITAL—Dpt. P. Wks., Toronto, plans by Kyles & Kyles, 247 John St. S., hospital addn. on Mountain. $7,000,000. CD 12/19/50.

▲ **Ont., Petawawa**—CAMP—Defence Constr. Ltd., 56 Lyon St., Ottawa, camp development, incl. permanent-type buildings, stores, garages, administration, recreation and drill hall, married quarters, theatre shopping area, $14,000,000.

▲ **Ont., Renfrew**—HOME FOR AGED—Renfrew Co., J. C. Simpson, chn., Renfrew, home for aged in Barnet's Property. $1,500,000.

Ont., St. David's—HIGH SCHOOL—Niagara District High School Bd., Bruce Cody, chn., St. David's high school, Niagara Stone Rd. near Virgil, $545,000.

▲ **Ont., Toronto**—JAIL—Municipality of Metropolitan Toronto, W. W. Guardhouse, clk., Don Jail Addn., Gerrard St. E. at Simpson Ave. $1,500,000.

▲ **Ont., Toronto**—SCHOOLS—Bd. Educ., Scarborough Twp., 1650 Kingston Rd., plans by Craig & Madill, 734 Spadina Ave., Agincourt High School addn., Agincourt $636,000; plans by Parrott, Tambling & Winter, 57 Bloor St. W., school, Warden Ave. $392,000, and school, Kennedy Rd. $441,000; plans by Carter, Coleman & Rankin, 2201 Kingston Rd., Ellesmere Public School, $320,000. CD 11/16.

Que., Drummondville—OFFICE—Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., plans by Morin & Cinq-Mars, 84 E. Notre Dame St., Montreal, steel, brick, concrete, stone office, Lindsay St. $500,000 CD 7/8.

▲ **Sask., Regina**—BARRACK BLOCK—Dpt. National Defence, Ottawa, Ont., barrack block, etc. at Army Camp. $1,500,000.

▲ **Yukon Territory, Whitehorse**—HOSPITAL—Dpt. P. Wks., Hunter Bldg., Ottawa, Ont., plans by E. A. Gardner, ch. archt., c/o owner, and Rule, Wynn & Rule, 11422 Jasper Ave., Edmonton, Alta., 120-bed hospital, nurse's residence staff quarters, power house, laundry. $3,000,000. CD 11/17.

COMMERCIAL BUILDINGS

▲ **Ark., West Memphis**—HOUSING DEVELOPMENT, SHOPPING CENTER—Clement & Norfleet Co., West Memphis, housing development, incl. 541 houses, 169-acres at junction of U. S. Hys. 61 and 70, $7,500,000, and shopping center $2,000,000. Robert Thomas Martin and William Boyd 23 North Dulap St., Memphis, Tenn., residential archts.

Calif., Campbell—SHOPPING CENTER—C[illegible] c/o Hollis Logue, Jr., archt., 275 N. 4 St., San Jose, shopping center. $750,000.

▲ **Calif., Garden Grove**—DWELLINGS—Boorey-Smith, 12321 Harbor Blvd., plans by L. C. Major & Assocs., 11015 S. Paramount Blvd., Downey, 163 frame, stucco dwellings, Tract 2410, $1,500,000.

▲ **Calif., Garden Grove**—DWELLINGS—Royal Crest Homes, c/o Reichl & Starkman, 251 S. Robertson Blvd., Beverly Hills, 350 dwellings. $3,500,000.

▲ **Calif., Los Angeles**—DWELLINGS—Nestor Home Builders, Inc., Queensbury Homes, Inc., 232 N. Canon Dr., Beverly Hills, 119 frame, stucco dwellings, Orion, McKeever and Simonds Sts. $1,200,000.

Calif., South San Francisco—SUPERMARKET, etc.—Safeway Stores, Inc., c/o Bramwell Constr. Co., 366 Grand Ave., Oakland, Calif., supermarket and facilities, Old Mission Rd. and Chestnut Ave. $500,000.

Conn., Riverside—SHOPPING CENTER—Farber-Wittman, Inc., c/o Morton Belove, Post Rd., shopping center, Post Rd. $700,000.

Ind., Columbus—SHOPPING CENTER—Henry Everroad, c/o Ervin Bank, Columbus, shopping center, incl. 30 stores. $600,000 or more.

Ind., Evansville—MUSEUM—Museum of Arts & Science, R. Malcolm Koch, pres., 216 N. W. 2 St., museum. $600,000.

▲ **Ind., Fort Wayne**—HOUSING—Spacemaker Homes, Inc., Robt. J. Allen, pres., 4105 Mound Pass, Fort Wayne, plans by W. A. Darling & Assocs., 414 Transfer St., 123 homes on 34-acre Belle Vista Pl. Subdivision. $1,000,000.

Ind., Gary—RECREATION, etc.—Teds Mobile Home Manor, 3141 E. Dunes Hy., plans by Schutt-Haley Assocs., 510 Jefferson St., recreation bldg., office and trailer court, $500,000.

Ind., Indianapolis—HOMES—J. A. McDaniel Co., 1501 Kentucky Ave., homes in Villa Park, $800,000.

Me., Brunswick—SHOPPING CENTER—Bath-Brunswick Shopping Center, c/o J. H. Miller, Inc., 194 Front St., Bath, 126x600 ft., masonry shopping center, incl. 12 stores. $750,000.

▲ **Md., Baltimore** — HOTEL — The Sheraton Corp., Sheraton-Belvedere Hotel, Charles and Chase Sts., Zone 1, plans by Perry, Shaw & Hepburn, 31 St. James Ave., Boston, Mass., Sheraton-Belvedere Hotel addn., $3,500,000-$4,000,000. CD 6/30/53.

Md., Hyattsville—CHURCH—St. Jerome's Catholic Church, 43 Ave. and Hamilton St., plans by Walton & Maddon, 3510 Rhode Island Ave., Mount Ranier, church and rectory. $500,000. CD 11/2/44.

Mass., North Easton—DORMITORIES—Stonehill College, Very Rev. F. J. Boland, SCS, pres., Washington St., 2 dormitories. $600,000.

▲ **Mass., North Easton**—COMMUNITY CENTER—Stonehill College, Very Rev. F. J. Boland, SCS, pres., Washington St., community center. $1,500,000.

▲ **Mich., Alpena**—HOSPITAL—Bd. Trustees Alpena Hospital, Alpena, 3 story wing hospital addn. $1,095,000.

▲ **Minn., St. Louis Park**—HOSPITAL—Asbury Methodist Hospital, 916 E. 15 St., Minneapolis, plans by McEnary & Krafft, 510 McKnight Bldg., Minneapolis, and Ellerbe & Co., E. 505 First National Bank Bldg., St. Paul, hospital, $3,500,000. CD 9/22.

Mo., Ladue (St. Louis 24 P. O.)—RESIDENCES—Flora Realty Investment Co., c/o Leeco Realty Co., 2241 S. Warson Rd., Zone 24, development of Somerset Downs subdivision incl. 35 deluxe type residences, installing sewers, macadam paving new streets, 104 acre site adjacent to Lindbergh Blvd. and Litzinger Rd. on Warson Rd. $750,000.

Mo., St. Joseph—DEPARTMENT STORE—Sears Roebuck & Co., 925 S. Homan St., Chicago, Ill., department store, 22 and Messanie Sts. $700,000.

▲ **N. Y., New York**—HOSPITAL WING—Lenox Hill Hospital, 76 St. and Park Ave., 12 story wing and other facilities at site. $3,500,000.

N. Y., New York—OFFICE—Sophie L. Wrona, 175 W. 93 St., plans by Hipolyte Kamenka, 101 Park Ave., Zone 17, office bldg., 60-66 E. 56 St. $700,000.

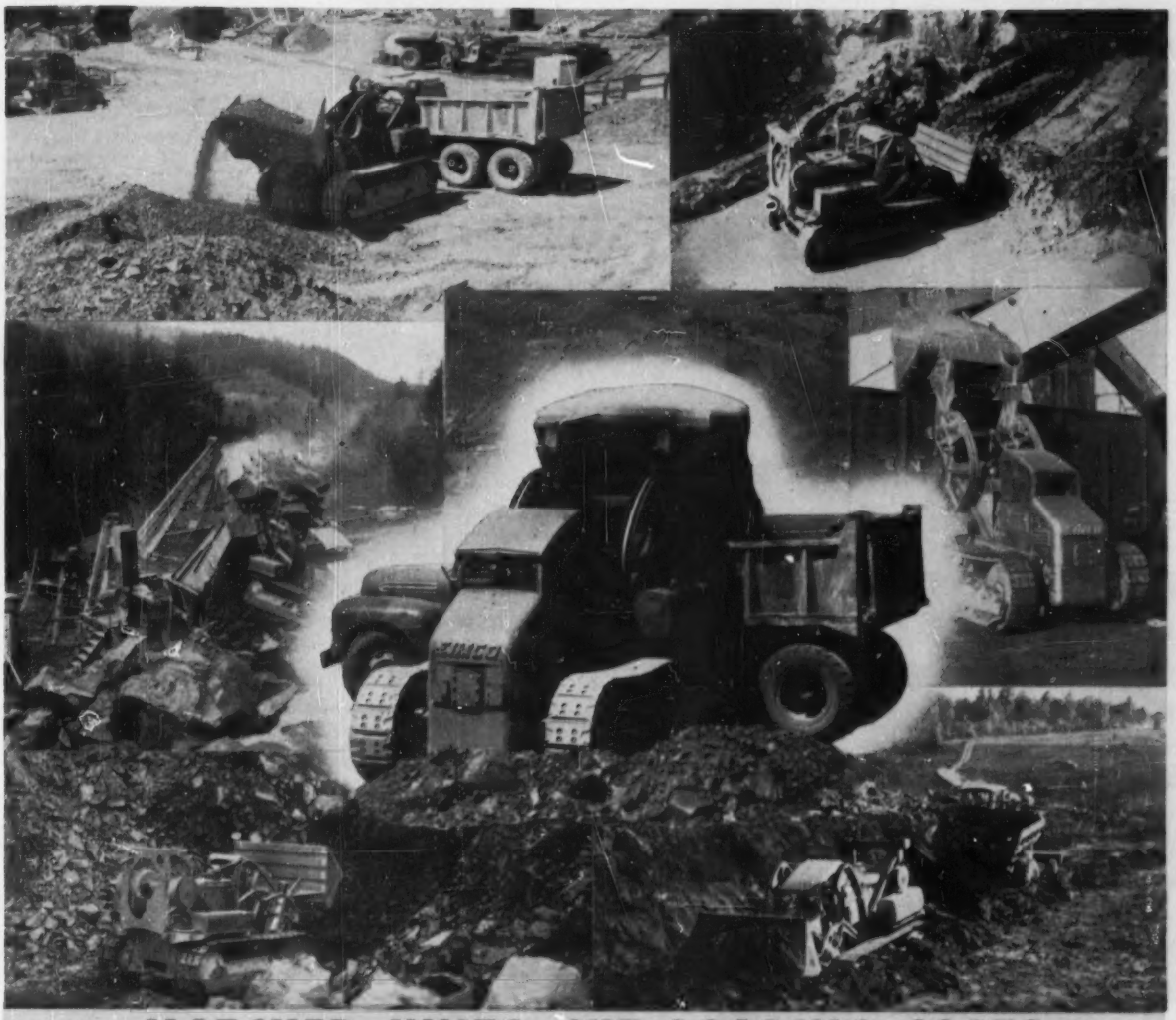
Ore., Eugene—Y.M.C.A. BLDG.—Young Mens Christian Assn., Eugene, plans by Hamlin & Martin, 159 W. 12 St., rein.-con. Y.M.C.A. bldg. $525,000.

▲ **Pa., Bala Cynwyd**—OFFICE and GARAGE—Vernon D. Cox & Co., 1428 S. Penn Square, Phila., plans by Aaron Colish, 117 S. 17 St., Phila., office and garage. $2,000,000.

S. C., Charleston Heights—SHOPPING CENTER—Clyde F. Boland, 130½ Tradd St., Charleston, shopping center, $500,000.

▲ **Tex., Dallas**—APARTMENTS—Genell, Inc., c/o Louis J. Hexter, 1312 Main St., Sec. 1, 35 unit apartment, $1,750,000; Sec. 2, 25 unit apartment, $1,500,000; Sec. 3, 50 unit-apartment, $2,750,000; Sec. 4, 40 unit apartment, $2,400,000, 50-acre site North Dallas.

(Continued on page 119)



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Eimco 105 Tractors designed to take Eimco loading-excavating attachments provide unbeatable performance in fast, economical loading.

Attachments mounted on conventional tractors cause overloads beyond the designed strength of crawler type equipment, but Eimco 105's are designed and built to take the extra load and vertical thrusts of these attachments. That is why you never hear an Eimco owner talk about track trouble, roller trouble or front idler trouble — the extra strength is built into the machine.

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847

Eimco 105

Eimco 105 with bulldozer attachment

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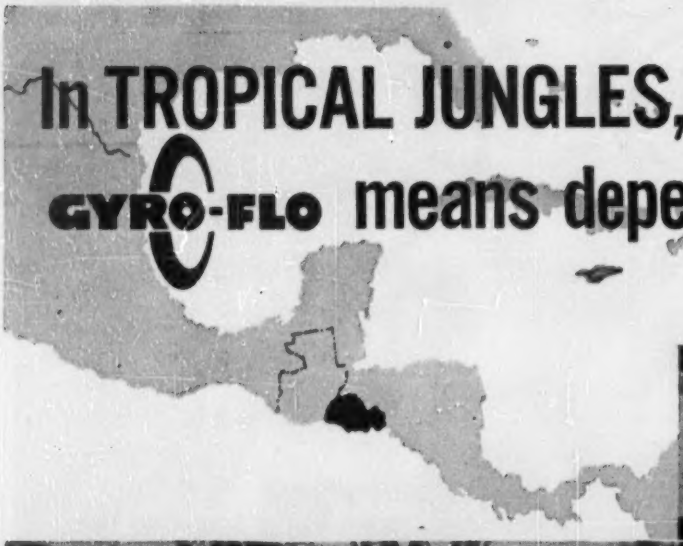


GYRO-FLO 315 cfm portable compressor on location near Laguna de Güija dam site, El Salvador. In this remote and isolated spot, GYRO-FLO's exceptional freedom from maintenance has been an important advantage.

A JHM Wagon Drill and three J-50 Jackdrills form the "business end" of this I-R Contractors' Combination—averaging 1200 feet per bit with Series 115 Carsets in hard abrasive basalt.

HERE, in the tropical jungle of Central America, an I-R Contractors' Combination is helping to dam the outlet of Lake Güija. Consisting of a 315 cfm GYRO-FLO portable compressor, JHM wagon drill and three J-50 Jackhamers, this combination is being used by Padilla-Cuéllar, contractors, for removal of 100,000 cubic meters of rock and the building of a 12 meter by 60 meter dam—part of a large hydro-electric project under the Comisión Ejercitiva del Río Lempa.

Drilling in hard abrasive basalt, with Series 115 Carset Jackbits, they have averaged 1200 feet per bit. And the 315 cfm GYRO-FLO rotary compressor has lived up to its reputation for smooth, trouble-free performance. On a job like this, where major service facilities are far away, *dependability* is a mighty big asset!

Plan now to take advantage of a GYRO-FLO on *your* next construction job. They're available in 125, 210, 315 and 600 cfm sizes. Ask your I-R representative for complete details.

I-R CONTRACTORS' COMBINATION

Ingersoll-Rand

11 Broadway, New York 4, N.Y., U.S.A.

2-78

(Continued from page 116)

▲ **Tex., El Paso**—DWELLINGS—DeWitt & Rearick, 500 N. Kansas St., Group 1, 55 frame, cinder block, stucco exterior dwellings, $304,500; Group 2, 75 cinder block, stucco exterior dwellings, $375,000; Group 3, 90 cinder block stucco exterior dwellings, $395,500; Group 4, 89 cinder block stucco exterior dwellings, $590,000, in Ranchland Hills area.

▲ **Tex., Galveston**—HOTEL, etc.—The Beach Corp., c/o Miramar Hotel, Seawell Blvd., plans by Thomas M. Price, 819 Broadway, 1 and 2 story, 50,000 sq. ft. 100-room hotel, swimming pool, etc. $1,000,000. Rivoire & Poole, 2506 Richton St., Houston, and R. L. Reid, 2506 Richton St., Houston, consult. engrs.

▲ **Tex., San Antonio**—APARTMENTS—Centex Constr. Co., 4911 Greenville St., Dallas, plans by Milam & Roper, 368 Casa Linda Plaza, Dallas, 2 story, brick, asbestos shingles apartments, east of Broadway off E. Mulberry St., $3,250,000. Holmes Ficklen, 7007 San Pedro St., consult. engr.

▲ **Wash., Bellevue**—HOUSES—Bell & Valdez, Bellevue, plans by J. Anderson, c/o owner, 4-year program, 4,000 houses in area between Bellevue and Lake Sammamish, $40,000,000.

▲ **Wash., Seattle**—STORES, etc.—University Properties, Inc., Cobb Bldg., 10 story bldg. with stores, offices, and parking facilities, Over $2,000,000.

Wis., Appleton—DORMITORY—Lawrence College, 112 S. Union St., plans by Frank C. Shattuck, 174 E. North Water St., Neenah, 3 and 4 story women's dormitory. $900,000.

▲ **Wis., Madison**—COMMERCIAL—Wisconsin Farm Bureau Federation, 188 S. Thornton Ave., plans by John J. Flad & Assocs., consult. engrs. and archts., 2523 University Ave., commercial bldg. $1,000,000.

Man., Winnipeg—APARTMENT—Owner, c/o G. A. Libling, 149 Portage Ave. E., apartment, Donald and Ellice Sts. $500,000.

Ont., Kingston—DEPARTMENT STORE—Simpson-Sears Ltd., 176 Yonge St., Toronto, plans by F. S. Corley, c/o owner, 2 story, 120x260 ft. department store, at shopping center, Princess St. W. $500,000.

Ont., Niagara Falls—HOTEL, etc.—Owner, c/o V. C. Thomas, 365 Queen St., 76-room hotel and 6 stores, 2 story with 3 story glass observation tower, Clifton Hill. $500,000.

▲ **Que., Quebec City**—HOSPITAL, etc.—Bd. Hospital of the Infant Jesus, 1401 18 St., hospital addn. for children, $750,000; pavilion addn. for adults, $1,000,000.

INDUSTRIAL BUILDINGS

▲ **Idaho, Lewiston**—MILL—Potlatch Forest, Inc., Lewiston, pulp and paper mill, $2,000,000.

▲ **Ia., Creston**—POWER PLANT, etc.—Southwestern Federated Power Co-operative, Creston, power plant addn. and equipment. $2,000,000. Stanley Eng. Co., Muscatine, consult. engr.

▲ **Ky., Russellville**—PLANT—Rockwell Mfg. Co., 689 Liberty Blvd., DuBois, Pa., plans by Eschweiler & Eschweiler, 726 E. Mason St., Milwaukee, Wis., 1 story, 100,000 sq. ft., brick, tile, steel mfg. plant. $1,000,000. CD 11/4.

▲ **Md., Friendship Airport** — PLANT — Westinghouse Electric Corp., B. M. Brown, mgr., Friendship Airport, 2 story, brick, steel, rein.-con., plant addn. $1,000,000, Walter Wendelkin, c/o owner, engr.

Pa., Beaver Falls—FACTORY, etc.—Armstrong Cork Co., Beaver Falls, factory addn. and silos. $600,000.

▲ **Tex., Freeport**—MINING PLANT—Standard Sulphur Co., Gilbert B. Ebard, Sr., Rosenberg, sulphur mining plant at Allen Dome, 10 mi. west of here. $1,500,000.

UNCLASSIFIED

▲ **Mo., Marshall** — POWER SYSTEM — City, voted $1,200,000 bonds Nov. 30, power sys. imprvs.

Nebraska—RURAL DISTRIBUTION LINES—K B R Rural Public Power Dist., Ainsworth, 650 mi. rural distr. lines, Keya Paha, Rock, Brown, Cherry, Holt and Loup Counties, $700,000. Raymond H. Reed & Co., Columbus, consult. engrs. CD 10/20/52.

† **N. J., Dover**—MISCELLANEOUS FACILITIES—U. S. Eng., 80 Lafayette St., New York 13, N. Y., misc. facilities, Picatinny Arsenal, $500,000-$1,000,000.

▲ **Okla., Cushing**—ELECTRIC LIGHT SYSTEM—City, exten. electric light sys. and power plant, $1,500,000, C. H. Guernsey & Co., 2701 N. Oklahoma St., Oklahoma City, consult. engrs. CD 9/27/54.

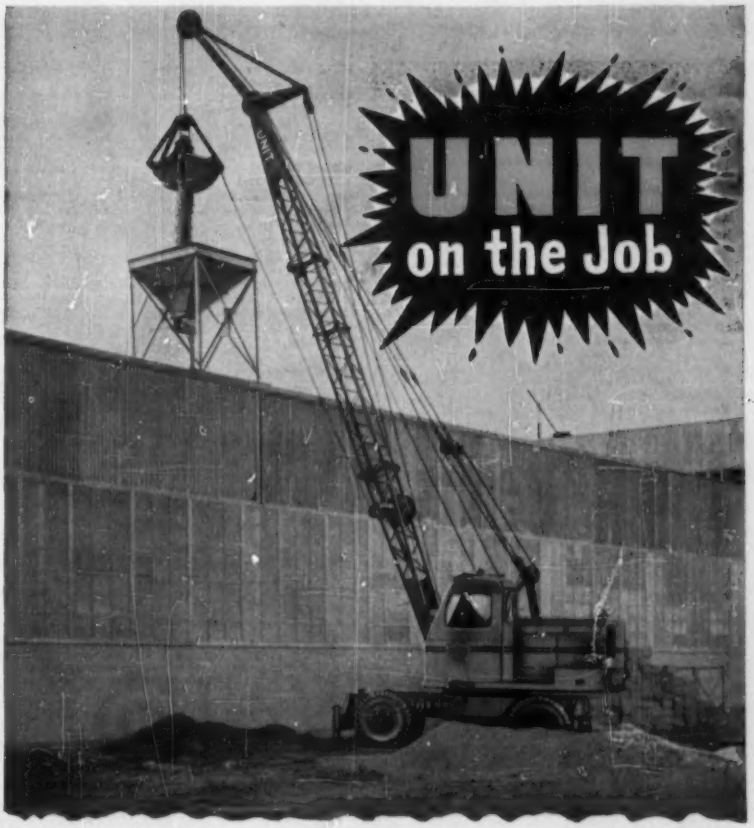
▲ **Tex., Houston**—TELEVISION STATION—Houston Television Co., Inc., 3005 Louisiana St., television station. $1,000,000. Jansky & Bailey, Inc., 1735 DeSales St. N. W., Wash. 6, D. C., consult. engr.

▲ **Tex., Houston**—TELEVISION STATION—TV Broadcasting Co. of Houston, Box 2161, television station, $1,400,000. Page, Crentz, Garrison & Waldschmitt, 710 14th St., N. W. Wash. 5, D. C., consult. engrs.

Tex., Port Arthur—TELEVISION STATION—Jefferson Amusement Co., Jefferson Theatre Bldg., television station, $565,000. William L. Foss, Inc., 927 Fifteenth St. N. W., Wash. 5, D. C. consult. engr.

Ont., Oshawa—ARENA—City, N. Dean, mayor, electors have approved artificial ice arena. $500,000.

Ont., Peterborough—ARENA—City, City Hall, ratepayers approved, community center arena. $500,000.



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Primarily this roofing job would require the erection of a scaffold-type elevator to hoist wheelbarrow loads of slag pebbles, plus a crew of men to load and unload the wheelbarrows. This means loss of setup time and duplication of handling. Now, with a UNIT 357, you drive up to the job — hoist the storage hopper to the roof — fill the hopper and the job is started. When insulation, roofing paper or other supplies are required, the UNIT 357 can move around the building to any location and hoist the material right on the spot where it's going to be used. Mr. Contractor, compare these two methods of material handling. Turn your lost time into PROFITS with UNIT.

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CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL

All Models Convertible to ALL Attachments!

Bids—Low Bids—Contracts—Second Section

NEW ENGLAND

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES
January 4 Massachusetts

R. I., Providence—BA 1/6—State of R. I. and Providence Plantations, F. A. Adams, purch. agt., State House, Sect. C, East St. Branch Interceptor No. 558, Roosevelt Branch Interceptor and Mill St. Branch Interceptor, Blackstone Valley Sewer Distr. Comm., at Central Falls. Approx. $700,000. Plans deposit $50. Metcalf & Eddy, 1300 Statler Bldg., Boston, Mass., engrs. CD 12/23/52.

BIDS ASKED—BUILDINGS

Mass., Swampscott—SYNAGOGUE—BA 1/14—Temple Israel, Rabbi Abraham L. Karp, 837 Humphrey St., (selected list bidders), brick, rein.-con. synagogue, 837 Humphrey St. $500,000-$600,000. Plans deposit $50. Pietro Belluschi & Carl Koch, 55 Brattle St., Cambridge, assoc. archts. Thomas T. Am'-iam, 404 Park Square Bldg., Boston, struct. engr. CD 6/2/53.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **MASSACHUSETTS**—Massachusetts Turnpike Auth., 80 Boylston St., Boston,
B. Perini & Sons, Inc., 73 Montwaite Ave., Framingham, Mass. CA $3,753,194. 4 mi. section of turnpike between Weston and Natick. CD 12/17, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Frechette & Clough**, Tupper Lake, N. Y., CA, $1,080,000. JUNIOR HIGH SCHOOL, SPRINGFIELD, VT. Town, Supt. Bldgs., Park St., Springfield, Vt. Bids Nov. 26. CD 12/2, under LB.

▲ **City, Real Estate Comm.**, City Hall Annex, Boston, Mass., received no bids Dec. 16, PUBLIC PARKING FACILITIES, Copley Square, St. James Ave. and Providence, Berkeley and Clarendon Sts., BOSTON, MASS. $1,125,000. CD 11/30.

▲ **Joseph Rugo, Inc.**, 581 Boylston St., Boston, Mass. LB $1,276,000, est. $1,200,000. HIGH SCHOOL, Nahatan St., WESTWOOD, MASS. Town, High School Bldg. Comm., T. S. Munson, chn., Colburn School, High St., Westwood, Mass. Bids Dec. 15. CD 11/23.

David Carlson, 865 Mountain Rd., West Hartford, Conn., Owner Builds, $500,000, RESIDENTIAL DEVELOPMENT, Kenwood area, Kenwood, Guerney, Westbrook and Livingston Rd., BLOOMFIELD, CONN.

Associated Constr. Co., 1010 Wethersfield Ave., Hartford, Conn., CA, $764,744, est. $750,000. High SCHOOL, Greer St. CROMWELL, CONN. Town, School Bldg. Comm., 463 Main St., Cromwell, Conn. Bids Nov. 30. CD 12/7, under LB.

MIDDLE ATLANTIC

STATE HIGHWAY LETTINGS
STREETS AND ROADS
January 11 Maryland

BIDS ASKED—BUILDINGS

D. C., Wash.—HIGH SCHOOL—BA 1/18—Order of Jesus & Mary, Highland Mills, N. Y., girl's high school, Academy of Jesus and Mary, Riggs Rd. and Metzerott Rd. N.E., $800,000. Plans deposit $25. Johnson & Boutin, 1417 22 St. N.W., archts. CD 11/19.

Pa., Greensburg—HIGH SCHOOL—BA 1/19—Hempfield Area Joint School Dist., Greensburg, 1 story, brick block, steel high school, Hempfield Twp. $500,000. Hunter, Caldwell & Campbell, 5 Ave. and 36 St., Altoona, archts.

SOON LETS CONTRACT—BUILDINGS

▲ **Md., Friendship Airport**—PLANT and OFFICE—Western Electric Corp., Air Arm Div., Friendship Airport, soon lets contract 2 story, brick, steel plant and office addn. $1,000,000. Walter Wendelkin, c/o owner's constr. div., engr. CD 12/13.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **NEW YORK**—Bureau Contracts & Accounts, The Governor Alfred E. Smith State Office Bldg., Albany,
The Arthur A. Johnston Corp. & McLean-Grove Co., Inc., 347 Madison Ave., New York 17, N. Y. CA $12,359,414, est. $14,252,000, 2.83 mi. Thy., 3.85 mi. Acc., New York State Thruway-New England Sect.-Sub. 2 (Kings Hy. to Chatsworth Ave.) and local and access roads, FANETC. 54-7, NETC 54-8. NET. 54-9, Westchester Co.;
Mount Vernon Contg. Corp. & Westroff & Oliver, 439 N. Terrace Ave., Mount Vernon, N. Y., CA $2,680,102, est. $3,163,000, 1.25 mi. Hy., 1.26 mi. Acc. New York State Thruway-New England Sect.-Subs. 1 and 2A (N. Y. City line to Kings Hy.) and local and access roads. FANETC 54-6, FANETC. 54-5, Westchester Co. Bids Oct. 28. CD 11/3, under LB.

NEW JERSEY—State Hy. Dpt., State Hy. Office Bldg., 1035 Parkway Ave., Trenton,
Peter W. Kero, Inc., 615 Newark Ave., Lyndhurst, N. J. LB $431,319, two overpass bridges, approaches on Route 208, one at Maple Ave., Glen Rock, and other at Lincoln Ave. Hawthorne, Bergen and Passaic Counties. Bids Dec. 14. CD 11/26.

MARYLAND—State Rds. Comm., 108 E. Lexington St., Baltimore, Zone 2,
Geo. F. Hazelwood Co., Cumberland, Md. LB $508,492. grading, drainage, relocation, surf. 2.857 mi. State Rte. 38, Contr. G 273-1-620, Garrett Co. Bids Dec. 14. CD 12/6.

▲ **MARYLAND**—State Rds. Comm., 108 E. Lexington St., Baltimore, Zone 2,
Princemont Constr. Corp., 1138 Fern St., Silver Spring, Md. CA $1,298,580. surf. 3.11 mi. State Rte. 586 Wheaton to Rockville, Contr. M 526-2-320, Montgomery Co. CD 11/29, under LB.

MARYLAND—State Rds. Comm., 108 E. Lexington St., Baltimore, Zone 2,
James Julian, Inc., 465 S. Dupont Rd., Elsmere, Del. CA $660,650. surf. 3.897 mi. State Rte. 113, near Berlin, Contr. WO 332-3-120, Worcester Co. CD 11/10, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **Woodbury Hills Homes**, c/o Albert B. Mecklenburg Organization, 1038 Northern Blvd., Roslyn, N. Y. Owner Builds. $5,000,000. 300 HOUSES, tract on Woodbury Rd., EAST MEADOW, N. Y.

▲ **Caristo Constr. Corp.**, 26 Court St., Brooklyn 2, N. Y. CA $1,949,000, general constr. JUNIOR HIGH SCHOOL, 218 Main St. and Gravett Rd., E-833, FLUSHING, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Nov. 23. CD 11/26, under LB.

▲ **Albarry Constr. Corp.**, 119 W. 57 St., New York 19, N. Y., CA $1,930,000, general constr. JUNIOR HIGH SCHOOL 185, 25 Dr., 149 St., 26 Ave. and 147 St., FLUSHING, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Nov. 30. CD 12/2 under LB.

Harry Jereski, Inc., 420 Lexington Ave., New York 17, N. Y. Owner Builds. $900,000. 7 story APARTMENT, 120 Hartsdale Ave. East, HARTSDALE, N. Y. Norman H. Behrens, 420 Lexington Ave., New York 17, N. Y., archt.

▲ **Caristo Constr. Corp.**, 26 Court St., Brooklyn 2, N. Y. CA $1,762,000, general constr. JUNIOR HIGH SCHOOL 217, 144 St. and 85 Ave., JAMAICA, N. Y. Bd. Educ., Bureau Constr., 42-15 Ccescent St., Long Island City 1, N. Y. Bids Nov. 10. CD 11/12 under LB.

▲ **Parkview Estates Homes**, c/o Smith & Anderson, archts., 3754 Merrick Rd., Seaford, N. Y. Owner Builds. $1,000,000. 50 HOUSES, Merrick Rd. and West Shore Dr., MASSAPEQUA, N. Y.

▲ **Caristo Constr. Co.**, 26 Court St., Brooklyn 2, N. Y. CA $1,255,000, general constr. Public School 197, 5 Ave. between W. 135 and W. 136 Sts., Manhattan Boro, NEW YORK, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Dec. 6. CD 12/8, under LB.

▲ **Caristo Constr. Co.**, 26 Court St., Brooklyn 2, N. Y. CA $1,266,000, constr. PUBLIC SCHOOL 19, 1st Ave. E. 11 and 12 Sts., Manhattan Boro, NEW YORK, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Dec. 2. CD 12/8 under LB.

▲ **Peaty & Furhman, Inc.**, 369 Lexington Ave., New York 17, N. Y., CA $1,159,000, general constr., PUBLIC SCHOOL 209, Utopia Parkway and 16 Ave., E-803, WHITESTONE, N. Y. Bd. Educ., Bureau Constr., 42-15 Crescent St., Long Island City 1, N. Y. Bids Nov. 26. CD 12/1, under LB.

▲ **Princeton Constr. Co.**, 747 Raritan St., Highland Park, N. J., Separate Contracts. $300,000 RESIDENTIAL DEVELOPMENT, Riverside Dr.; $800,000. RESIDENTIAL DEVELOPMENT, Overbrook Dr.; $300,000, RESIDENTIAL DEVELOPMENT, Marion Road west, PRINCETON, N. J. Grand total $1,400,000. George Boylon, c/o owner, archt.
Louis H. Cahan & Co., 1411 Walnut St., Phila., Pa. Separate Contracts, $500.000. PARCEL POST BLDG., TRENTON, N. J. CD 5/12.
▲ **Louis Feidscher & Son**, 2534 W. Thompson St., Phila., Pa., Separate Contracts. $1,500,000. RESIDENTIAL DEVELOPMENT. New Ardmore Rd., BROOMAL, PA.
▲ **Chalfont Builders, Inc.**, 4400 "B" St., Phila., Pa. Separate Contracts. $1,000,000. RESIDENTIAL DEVELOPMENT, County Line Rd., CHALFONT, PA.
Sturm & Co., Inc., 4531 N. Front St., Phila., Pa., LB $453,185. Joint Junior-Senior HIGH SCHOOL alterations, addns., LARCHMONT, PA. Marple-Newtown Joint High School Bd., Larchmont, Pa. Bids Dec. 7. CD 11/24.
Moyer Bros., 2605 Beale Ave., Altoona, Pa., CA Total est. $600,000. (A) 1 story, brick RECREATION BLDG. (B) two 2 story brick, block, steel DORMITORIES, LORETTO, PA. St. Francis College, Loretto, Pa Bids Oct. 19. CD 10/14.
Costello Bros., Albion and Stamford Sts., Phila., Pa., Separate Contracts. $540,000. RESIDENTIAL DEVELOPMENT, Hargrove St., etc. PHILA., PA. H. Stanley Atkinson, 10 S. 18 St., Phila., Pa., archt.
Somerton Terrace Homes, Inc., 6219 N. 11 St., Phila., Pa., Separate Contracts. $450,000. RESIDENTIAL DEVELOPMENT, Depue and Renard Sts., PHILA., PA. Henry S. Berg, 1411 Walnut St., Phila., Pa., archt.
▲ **Laver Bros. Constr. Corp.**, 1201 Chestnut St., Phila., Pa., Separate Contracts. $2,500,000. RESIDENTIAL DEVELOPMENT, Large and Shelmire Sts., PHILA., PA. J. Ethan Fieldstein, 1325 Walnut St., Phila., Pa., archt.
▲ **James H. Wood, Inc.**, 15 E. North St., Dover, Del., CA, $1,190,000, two Elementary SCHOOLS, DOVER, DEL. Dover Special School, Dover Del. Bids Dec. 1. CD 12/14, under LB.
Morton Macht, 11 E. Fayette St., Baltimore 1, Md. Owner Builds. $629,000. eighty-five 2 story, brick HOMES, Lucia Ave., Cedargarden Dr., Greenhill Ave., Parkside Dr., BALTIMORE, MD.
John S. Stubbs Co., Kensington, Md. CA $593,500. masonry Elementary SCHOOL 3 mi. south of Hagerstown, Rte. 11, HAGERSTOWN, MD. Washington Co. Bd. Educ., Court House, Hagerstown, Md. CD 12/20, under LB.
N. & M. Builders, Inc., 8502 Dixon Ave., Silver Spring, Md. CA $600,000. sixty-eight 1 and 2 story, 38x26 ft., 26x40 ft., concrete block, brick frame HOUSES, Connecticut Avenue Park, SILVER SPRING, MD. Connecticut Knolls, Inc., c/o N. M. Builders, Inc., 8502 Dixon Ave., Silver Spring, Md. Morton W. Noble, 2000 P St. N.W., Wash., D. C., archt.

SOUTH

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
STREETS AND ROADS
January 26 Louisiana

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

† **VIRGINIA**—Bureau P. Rds., Dpt. Commerce, 1440 Columbia Pike, Arlington,
Moore Bros., Box 258, Verona, Va., LB $101,197. blt. surf. tr., etc. Hebron Rd., Proj. 229-A, Virginia Forest Hy., Rockingham Co.;
F. D. Cline Paving Co., Box 349, Raleigh, N. C., LB $351,701, paving, etc. from Thornton Gap to Crescent Rock, Proj. 1A486, Shenandoah National Park, Rappahannock, Page and Madison Counties. Bids Dec. 16. CD 11/23, 11/26.

▲ **SOUTH CAROLINA**—Hilton Head Toll Bridge Auth., Wannamaker & Wells, Inc., Orangeburg, S. C., LB $845,554, double span bridge;
Atkinson Dredging Co., Great Bridge, Va., LB $210,469, 1½ mi. approaches and connecting fill for constr. toll bridge from Hilton Head Island to South Carolina mainland, Beaufort Co. Bids Dec. 21. CD 12/8

▲† **J. A. Jones Constr. Co.**, 209 W. 4 St., Charlotte, N. C., LB $2,048,379, addnl. dormitories, headquarters bldg. and dining halls, Charleston Air Force Base, No. 38-081-55-13, CHARLESTON, S. C. U. S. Eng., Customhouse, Charleston, S. C. Bids Dec. 15.

▲ **FLORIDA**—State Road Dpt., Tallahassee,
Coggin & Deermont, Chipley, Fla., CA $1,368,612 sand clay base with blt. surf. tr. 792 ft., constr. bridge, and 3,062 ft. bridge over Escambia River, 3 concrete box culverts, small drainage structures, 13.46 mi. State Road 184, Job 4825-101, Escambia Co. Bids Nov. 30, awarded Dec. 15. CD 12/3, under LB.
Henry Bickel Co., 1020 E. Chestnut St., Louisville 4, Ky. LB $824,217. Contr. 162, Upper Dry Run trunk Sewer Sect. C., LOUISVILLE, KY. Metropolitan Sewer Dist., 414 W. Jefferson St., Louisville, Ky. Bids Dec. 17. CD 11/29.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ **H. K. Ferguson Co.**, 1763 E. 11 St., Cleveland, O., CA Est. $10,000,000. Isocyanates chemical PLANT, WAREHOUSE, and CONTROL BLDG., near NATRIUM, W. VA. Mobay Chemical Co. Subsidiary of Monsanto Chemical Co., 1700 S. 2 St., St. Louis, Mo.

† **Goode Constr. Corp.**, Builders Bldg., Charlotte, N. C., LB $517,808, est. $590.607, administrative and industrial facilities, Wilmington Ammunition Loading Terminal, ENG-31-075-55-15, WILMINGTON, N. C. U. S. Eng., 308 Customhouse, Wilmington, N. C. Bids Dec. 15. CD 11/4.

MIDDLE WEST

BIDS ASKED—HEAVY CONSTRUCTION

Ill., Park Ridge—BA 1/18—City, City Hall, water system exten., 20,000 ft. c.i. water mains, water pumping station, $500,000. Consoer, Townsend & Assocs., 351 E. Ohio St., Chicago, Zone 4, engrs. CD 5/28.

BIDS ASKED—BUILDINGS

O., Fostoria—SCHOOL—BA 1/20—Bd. Educ., H. L. Ford, supt. Schools, Fostoria, school expansion $975,000. CD 11/5.

▲ **Wis., Milwaukee**—SCHOOL—BA 2/17—School Bd., 1111 N. 10 St., Zone 3, 84th St. Junior High School. $2,500,000. Grassold-Johnson & Assocs., 734 N. Jefferson St., archts. CD 6/7.

▲ **Ill., Belleville**—HOSPITAL—BA 3/15—Protestant Hospital Builders Club, Inc., Oliver J. Joseph, pres. and W. Shiekedanz, secy., 223 W. Main St., 1 story, irregular shape, 86-bed brick, steel, concrete general hospital, 10-acre tract adjacent to Bellevue Park, $1,500,000. Hellmuth, Yamasaki & Leinweber, 825 Locust St., St. Louis 1, Mo., archts. CD 12/31/52.

(Continued on page 123)

LABORATORY FACILITIES AT
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TOUSEY PRODUCTS
DURACOTE for DURABILITY
IN the control laboratory at Tousey the constant testing of raw materials is the major operation. To do this properly, carefully trained personnel, adequate technical equipment of all sorts with proper maintenance of same, are used. Tens of thousands of dollars are spent each year by Tousey in the constant rigid control of manufacturing standards. ★ A valuable service to you as a Tousey customer.
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As manufacturers of motor cars, it is only natural for us to be receptive to sound highway planning.

But just as Americans, it is equally natural.

For most Americans know that investing in good roads is one of the surest ways of helping our economy and our way of life.

Better roads open new opportunities for agriculture and industry. They knit our nation more closely. They broaden our horizons.

They prepare the nation to mobilize quickly in emergencies . . . and to disperse key industries more easily in the event of enemy attack.

The President's highway program will give state and local communities an added incentive for pushing ahead with their own modern highway programs.

The size of this investment in America's future will depend on how high we, the people of America, decide to set our sights. We have the talents, the resources, the knowledge, the techniques . . . and we have the will!

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(Continued from page 120)

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **OHIO**—State Hy. Dpt., Columbus,
D. W. Winkelman Co., Inc., 205 Harrison St., Syracuse, N. Y., CA **$2,458,859**, est. $2,827,400, Type T-35 on B-70 and structures 2.147 mi. S. R. 18R, Sect. 12.10. (Part No. 6-Akron Expressway System), City of Akron, Summit Co.;
George W. Lathrop & Sons, Inc., 1510 Montcalm St., Box 772, Toledo, O., CA **$786,380**, est. $1,051,700, Type T-50, T-70 and structure 0.908 mi. C. R. 68, S-313 (3), Adams Twp., Lucas Co. Bids Dec. 14. CD 12/21, under LB.

▲ **INDIANA**—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis, Zone 4,
Winston Bros. Co., 1470 Northwestern Bank Bldg. Minneapolis 2, Minn. and **A. D. Taylor Wheless Co., Inc.**, P. O. Box 67, Elmore, O., CA, **$7,577,768**, Contracts C-17/18/19, Indiana East-West Toll Road, La Porte Co. Bids Nov. 3. CD 11/11, under LB.

▲ **INDIANA**—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis, Zone 4,
Western Contg. Corp., 400 Benson Bldg., Sioux City Ia., CA **$7,408,867**, Contract C-33/34, C-35, C-36/37, Indiana East-West Toll Road, Elkhart Co. Bids Dec. 1. CD 12/6, under LB.

▲ **INDIANA**—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis, Zone 4,
Traylor Brothers, Box 66, Evansville, Ind., CA, **$5,727,010**, Contract C-15/16, Indiana East-West Toll Road, Porter Co. Bids Dec. 8. CD 12/17, under LB.

▲ **INDIANA**—Indiana Toll Road Comn., 309 W. Washington St., Old Trails Bldg., Indianapolis, Zone 4,
Traylor Brothers, Station B, Box 66, Evansville, Ind., CA, **$4,063,738**, Contract C-20/21, Indiana East-West Toll Road, La Porte Co. Bids Oct. 13. CD 11/11, under LB.

▲ **INDIANA**—State Hy. Comn., Indianapolis,
W. L. Magaw, Richmond, Ind., LB, **$74,103**, 1.17 mi. U. S. 40 (National Rd.) from Southwest Fifth St. east to Southwest First St.; 0.51 mi. on U. S. 40 from National Road north on Southwest Fifth St. and 2.6 mi. on U. S. 40 (Main St.) from E. 12 St. to Elks County Club Road, in Richmond, Wayne Co.; LB **$150,942** on U. S. 40 in Lewisville from ½ mi. west of town to just east of east line in Straughn from east limit to west; from west limit of Dublin to east limit of Mt. Auburn between east and west limits of Centerville, Henry and Wayne Counties;
McMahan Constr. Co., Rochester, Ind., LB, **$1,778,931** reconstr. intersection of U. S. 6 and U. S. 31 and approaches St. Joseph and Marshall Counties; LB **$218,670** Ind. 28 from 1½ mi. west of Clinton-Tipton line to west edge of Tipton, Tipton Co.; LB **$189,528**, Ind. 32 from just west of east limit of Winchester to about ½ mi. west of Ind. 227 Randolph Co.; LB **$266,534**, Ind. 67 from Owen-Morgan line to just south of junction with Ind. 39 west of Martinsville, Morgan Co.;
Arcole Midwest Corp., 3225 Main St., Skokie, Ill., LB, **$811,516** extension of Ind. 420 Tri-State Highway in Gary just west of Oak Wood Dr. to about ¼ mi. west of Clark Rd., Lake Co.;
William D. Vogel Constr. Co., 3760 E. St. Clair St., Indianapolis, Ind., LB, **$1,005,933**, U. S. 31-E and Ind. 62 from Municipal Bridge to Jeffersonville to just north of Kopp Lane and another roadway to McKinney and Brooks Aves. in Clarksville, Clark Co.;
Moellering Constr. Co., 241 Murray St., Fort Wayne, Ind., LB, **$632,348** 5 mi. U. S. 27 from just northwest of Hoagland Rd. to about half mile northwest of Maples Road south of Fort Wayne, Allen Co.; LB **$692,036** conditional bid, U. S. 27 from Maple Road to just north of Pettit and Lafayette Sts. in Fort Wayne, Allen Co.;
Spears Dehner, Inc., Fort Wayne, Ind., LB, **$712,866** lowest regular bid for U. S. 27 from Maple Rd. to just north of Pettit and Lafayette Sts. in Fort Wayne, Allen Co.;
McMahan Illinois Corp., Watseka, Ill., LB, **$249,629** on U. S. 30 from Ind. 2 south of Valparaiso to just east of U. S. 421 east of Wanatah, Porter and La Porte Counties;
L. P. Cavett Co., 511 Shepherd St., Lockland, O., LB, **$69,363**, Ind. 67 and Ind. 57 to just south of Prairie St. in Worthington, Greene Co.;
Mohr Constr. Co., 1420 S. Union St., Kokomo, Ind., LB, **152,062**, Ind. 37 from 4 mi. southwest of U. S. 35 to Ind. 9 south of Marion, Grant Co.

▲ **Green Bay Water Comn.**, Green Bay, Wis., rejected bids pipe line and intake, GREEN BAY, WIS. Est. $5,700,000. Will re-advertise. Alvord, Burdick & Howson, 20 N. Wacker Dr., Chicago, Ill., consult. engrs. CD 10/27/53, under LB.

BUILDINGS

LOW BIDS AND CONTRACTS

Larcomb Builders, 780 Oakland Park Ave., Columbus, O. CA Approx. **$888,000**. 74 frame DWELLINGS, in 3300, 3400, 3500 and 3600 blocks of Medina Ave., COLUMBUS, O. Blenheim Homes, Inc., 780 Oakland Park Ave., Columbus, O.
Esther Mfg. Co., 2227 Rockne Ave., South Bend, Ind., Owner Builds, $500,000. 50 HOMES, SOUTH BEND, IND.
Sherman Olson Co., 219 N. Kilpatrick St., Chicago, Ill., CA, $500,000, OFFICE and SERVICE BLDG., RIVER FOREST, ILL. International Business Machines Corp., 618 S. Michigan St., Chicago, Ill. Peter Camburas, 105 W. Madison St., Chicago 2, Ill., archt. Awarded Dec. 13.
Pearson Constr. Co., Benton Harbor, Mich. CA Est. $525,000. CHURCH and EDUCATION BLDG., BRIDGMAN, MICH. Immanuel Lutheran Church, Harold Ott, pastor, Bridgman, Mich. Frank Abrahamson, Endicott-on-Robt. Bldg., St. Paul, Minn., archt. CD 7/2/53.

HARD-PACKED CLAY couldn't stop this McKIERNAN-TERRY PILE HAMMER

To prepare the foundation for the concrete spillway of a new Texas dam, many, many piles were needed . . . 2,127 of them. In addition, the piles had to be driven into resistant, hard-packed clay.

It might have been a tough and lengthy job, but not to the powerful, fast-driving McKiernan-Terry 11 B3 Double-Acting Pile Hammer wisely selected by the contractors, Reynolds & Williams and Noonan Construction Co.

Contractors all over the world have learned from experiences like this that McKiernan-Terry Hammers can always be depended upon for speedy, economical pile-driving jobs.

Write for Bulletin.

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McKIERNAN-TERRY CORPORATION, Manufacturing Engineers
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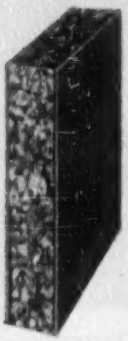
New Orleans Cincinnati Pittsburgh
PILE DRIVING CONTRACTORS SINCE 1910

SERVICISED PRODUCTS
for Concrete Paving



The average concrete paving job, whether it be an airport runway, a city street, or a state highway or turnpike, requires the use of four groups of Servicised Products. The first of these is **AIR ENTRAINING AGENT** added to the concrete at the mixer to produce a more durable concrete.

Premolded Expansion Joint Fillers

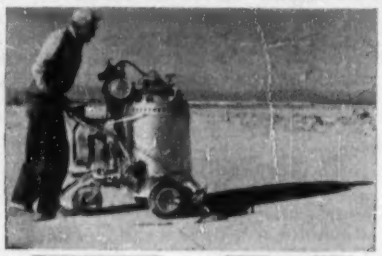
KORK-PAK – an exclusive Servicised development – is the all-purpose concrete paving joint filler. Composed of cork granules bonded together with asphalt between two sheets of heavy asphalt saturated paper. **KORK-PAK** is the *lowest cost non-extruding joint filler on the market*. **KORK-PAK** recovers more than 80% of original thickness after compression, and has a very low rate of moisture absorption. Available in ¼", ⅜", ½", ¾", and 1" thicknesses and standard lengths of 5 or 10 ft. Longer lengths available on special order. The Servicised premolded joint filler line also includes Asphalt, Cork, Self-Expanding Cork, and Sponge Rubber types, as well as Longitudinal Tongue and Groove Joint and premolded Dummy Contraction Joint.

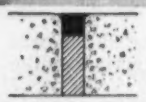
Joint Sealers

Para-Plastic Hot-Poured Joint Sealer is an extremely stable rubberized asphalt compound that forms a resilient, adhesive and effective seal – keeping the joint completely protected under any and all conditions of temperature, moisture and traffic. Para-Plastic is pumped directly into the joint from the melting kettle.

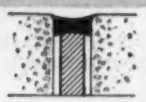
Para-Plastic JF for airport paving has the sealing characteristics of the standard compound, but in addition is impervious to solvents and jet fuel spillage.

SERVITITE Cold-Applied Joint Sealer is a bituminous rubber sealer so compounded that it can be pumped cold from the drum in which it is shipped directly into the joint to be sealed.

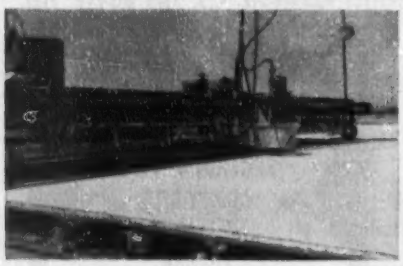




Joints compressed in warm weather temperatures



Joints opened in sub-zero temperatures



Membrane Curing Compounds

Available in two types—White Pigmented and Clear. Sprayed or painted on concrete, they form a uniform, moisture-retaining membrane to insure proper curing. Pigmented type reflects heat, reducing temperatures as much as 15°; Clear type, available with fugitive dye to assist in getting uniform coverage is used indoors or where natural color of the concrete must be retained.

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▲ Ward W. Ross, Inc., Pontiac, Mich. CA $1,186,594. general contract HIGH SCHOOL, Abbott Rd., EAST LANSING, MICH. City, C. E. MacDonald, supt. Schools, East Lansing, Mich. CD 11/30, under LB.
▲ Christman Co., 408 Kalamazoo Plaza, Lansing, Mich. CA $3,188,143. general contract;
C. L. Mahoney, 438 Forest St., Lansing, Mich. CA $738,750. mechanical contract 10 story CITY HALL, 6 story POLICE STATION, LANSING, MICH. City, City Council, Lansing, Mich. CD 11/3, under LB.

WEST OF MISSISSIPPI

BIDS ASKED—HEAVY CONSTRUCTION
STATE HIGHWAY LETTINGS
BRIDGES
January 28 Missouri
STREETS AND ROADS
January 4, 5 Colorado

† Tex., Channelview—BOMB AND SHELL DISASSEMBLY AREA—BA 1/6—U. S. Eng., Box 1229, Galveston, bomb and shell disassembly and barricade for railroad, spur suspect cars, incl. 8-acres grubbing and clearing, embankments, water lines, storage house, small standard gage railway track and other allied facilities, San Jacinto Ordnance Depot, Inv. No. ENG-41-243-55-31. $100,000-$500,000. Extended date. CD 11/5.

Tex., Dallas—BA 1/11—City, City Hall, Main and Harwood Sts., relocation Lemmon Ave. from University Blvd. to N. W. Hy. $499,000; widening, paving Lovers Lane, Cotton Belt Ry. to new Lemmon Ave. route, $461,000. Koch & Fowler, 3900 Lemmon St., engrs. CD 11/21/51.

† Texas—BA 1/12—U. S. Eng., Box 1229, Galveston, Galveston Harbor and Channel dredging, 2,780,000 cu. yd., Galveston, Inv. No. CIVENG-41-243-55-30. $275,000-$875,000. CD 6/9/44.

Minn., Wadena—BA 1/19—Village, J. H. Ehlen, clk., sewage treatment plant, $300,000. Plans deposit $20. Hitchcock & Estabrook, 300 Lincoln Bldg., Minneapolis, engrs. CD 11/11.

▲† Tex., Kelly Air Force Base—RUNWAYS, etc.—BA 2/8—U. S. Eng., Box 1229, Galveston, 11,500 ft.x300 ft., 385,000 sq. yd. pavement runway; 107,000 sq. yd. new taxiway; strengthen 53,000 sq. yd. taxiway, 251,000 sq. yd. aprons and warm-up pads; 188,000 sq. yd. 2 in. b. conc. on 13 in. base material paved shoulders; 11,550 lin. ft. high intensity runway lighting, 235 mi. 2-lane road, flexible base; 7,500 lin. ft. pipe from 18 to 72-in. diam., box culvert, 5,000 cu. yd. concrete; 50,000 cu. yd. excavation ditches, 50,000 cu. yd. excavation inlets, headwalls and bridge repair; clearing and grubbing 9 acres, relocate 2 bldgs., remove storm drains and utility lines, remove bldg. foundations, concrete pavement, asph. pavement and drainage structures, constr. 8,000 lin. ft. chain fence; relocate and encase utility lines; relocate electric power lines under airfield; relocate telephone lines under airfield. Inv. No. ENG-41-243-55-33. $12,000,000. GD 4/30/52.

BIDS ASKED—BUILDINGS

Tex., Cypress-Fairbanks—SCHOOL — BA 1/5 — Cypress-Fairbanks Independent School Dist., John Telge, pres. Bd. Trustees, Fairbanks, school constr. $550,000. Lloyd & Morgan, 4605 Montrose Blvd., Houston, archts. I. A. Naman, 3303 Montrose Blvd., Houston, and Walter P. Moore, 2 Pinedale St., Houston, engrs. Bids Nov. 15 rejected. LB $617,200. CD 11/24, under LB.

▲ Kan., Kansas City—WAREHOUSE—BA 1/6—Safeway Stores, Inc., 1950 Army St., San Francisco, Calif., expansion 49x230 ft., brick, concrete block meat warehouse, imprv. frozen foods bldg., perishable goods warehouse, $2,500,000. CD 7/15/53.

Tex., Austin—RECEIVING BLDG., etc.—BA 1/6—Board for Texas State Hospitals & Special Schools, 4405 Lamar Blvd., 27,000 sq. ft., steel, brick receiving and intensive treatment bldg. for Austin State School. $475,000. Walter C. Moore, 4404 Lamar Blvd., and Wirtz, Tungate, Calhoun & Jackson, 500 Stuart St., Houston, archts. Rivoire & Poole, 2506 Richton St. and R. L. Reid, 2506 Richton St., Houston, engrs. CD 12/2/53.

▲ Minn., St. Paul—SCHOOL—BA 1/11—Bd. Educ., F. E. Conner, supt., L. E. Kinvig, city purch. agt., 253 City Hall, 1 story, part 2nd floor Como Park Junior High School, Maryland and Dale Sts. $1,200,000. Haarstick, Lundgren & Assoc., W. 1391 First National Bank Bldg., archts. CD 3/15.

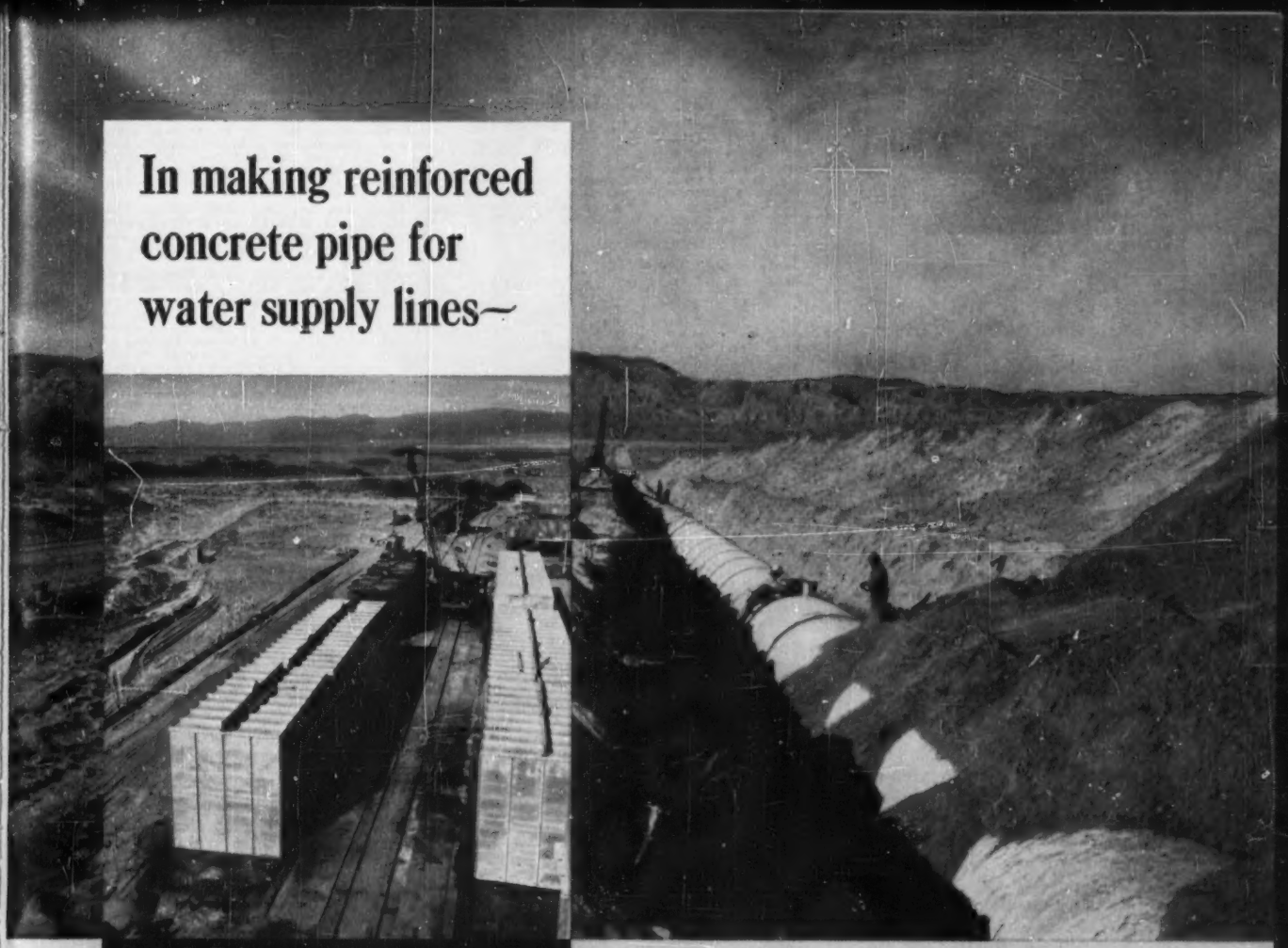
Tex., Galena Park—HIGH SCHOOL—BA 1/17—Galena Park Independent School Dist., Galena Park, Galena Park Senior High School. $550,000. Plans deposit $25. Herbert Voelcker & Assocs., 1212 Dennis St., Houston, archts. CD 10/6.

† Tex., Texarkana—SHOP—BA 1/19—U. S. Eng., Box 61, Tulsa 2, Okla., post engineer utility shop, drilled concrete underreamed piers and concrete grade beams, masonry walls, 27,000 sq. yd. double asph. parking paving, Red River Arsenal, Inv. No. ENG-34-066-55-9. $200,000-$475,000. Extended date. CD 12/10.

Tex., Dallas—OFFICE—BA 1/21—Republic National Life Insurance Co., Central Expressway and Carroll St., 3 story, bsmnt. office. $875,000. Extended date. Roscoe DeWitt, 2025 Cedar Springs St., archt. CD 10/27.

▲ Minn., Edina-Richfield—SHOPPING CENTER—BA 2/1—The Dayton Co., Seventh St. and Nicollet Ave. and L. S. Donaldson Co., 601 Nicollet Ave., Minneapolis, Southdale Center shopping proj. in area of 66 St. and France Ave. South. $6,000,000. Victor Gruen Assoc., 700 Nicollet Ave., Minneapolis, Larson & McLaren, 1901 Foshay Tower, Minneapolis, and D. Griswold, 80

(Continued on page 126)



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If your pipeline project is anywhere in the Western States—there is an American plant to serve you . . . equipped to supply quality pipe products . . . organized for efficient service.

Most job requirements can be met by existing plants strategically located throughout the West, but where distance and transportation factors exist and where the quantity of pipe involved is sufficient, it is frequently advantageous to set up pipe-making plants near the jobsite.

In the past few years American Pipe and Construction Co. has established many jobsite plants throughout the West. Substantial savings have been realized, for customers and manufacturer alike, by erecting these plants close to the project.

Wherever your next project is to be, we would like to help you plan it. An inquiry directed to any of our regional offices will receive prompt attention.

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COMMENT
from the
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One man batching for a complete Roadbuilder's set-up.

Cement, fine and coarse aggregates in 3 separate bins, yet all batched by one man.

And we can convert your present Plant (regardless of make) to this new system . . . We have big news also for Roadbuilders about greater Plant portability. Check with us right away. These developments will have an important influence on your bids.

Biggest news in Ready Mixed Concrete comes from Butler, too.

A punched card now electronically batches 6 aggregates, 3 cements and water. Selection of batches is *virtually infinite.* No chance for human error. Plant is entirely automatic and completely interlocked . . . The punched cards are filed for reuse at any time — and with suitable additional equipment, could be used for automatic invoicing and bookkeeping. Card batching too, we can install in your present Plant, no matter who the manufacturer.

I was shoveling sidewalk snow the other A.M. Neighbor came by and said "Hi. You know this wonderful snow makes me feel *irnl; Yule-y!*"

Noticed when I returned that evening, a mound of new-fallen snow marked his still-undiscovered corpse.

Yours:

The Butler Engineer

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

(Continued from page 124)

S. Seventh St., Minneapolis, archts. CD 6/25/52, under, Minn., Minneapolis.

Tex., Austin—DORMITORIES, etc.—BA 2/8—Bd. for Texas State Hospitals & Special Schools, 4405 Lamar St., two dormitories and one infirmary for State Farm Colony. $500,000. Walter C. Moore, 4405 Lamar St., superv. archt. C. H. Page & Son, 1st Federal Savings & Loan Bldg., Box 396, archts. CD 10/8/52.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

▲ **MINNESOTA**—State Hy. Dpt., 1246 University Ave., St. Paul,

Woodrich Constr. Co., Hopkins, Minn. LB $783,781. c. conc. 14 mi. between Foley and Milaca, Benton and Mille Lacs Counties;

Central States Constr. Co., Crosby, Minn. and **Megarry Bros.**, St. Cloud, Minn. LB $565,671. c. conc. 8.4 mi. between W. Jct. TH 7 and East limits of Hutchinson, McLeod Co;

Fairway Constr. Co., Hector, Minn. LB $220,798. grav. base, road-mixed bit. surf. 10.5 mi. between 3.8 mi. north of Ogilvie and Isle, Kanabec and Mille Lacs Counties. Bids Dec. 17. CD 12/1.

Phelps-Drake Co., 1415 SE Eighth St., Minneapolis, Minn. LB $121,992. Bid A, lift stations;

Acton Constr. Co., 1071 W. County Road C, St. Paul, Minn. LB $108,856. Bid B, south and east lift stations;

O. B. Ashbach & Sons, 2975 Hamline Ave. N., St. Paul, Minn. LB $239,175. Bid C, north interceptor sewer;

Lametti & Sons, 211 N. Pascal St., St. Paul, Minn. and **P. Lametti Constr. Co.**, 615 Drake St., St. Paul, Minn. LB $489,591. Bid D, south trunk sewer;

L. J. McNulty, 2001 Wentworth Ave., South St. Paul, Minn. LB $80,668. Bid E, Dist. 6A, CRYSTAL, MINN. Village, Mrs. Clara Hillstrom, clk., Crystal, Minn. Bids Dec. 14. CD 11/24.

† **F. R. Comb Co.**, 2901 Aldrich Ave. S., Minneapolis, Minn. LB $511,555. Schedule 1 recreation and maintenance bldgs.; LB $67,351. Schedule 2 post exchange, Duluth Air Force Base, DULUTH, MINN. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids Dec. 15. CD 11/19.

▲ **MISSOURI**—State Hy. Dpt., Jefferson City,

Porter DeWitt Constr. Co., Inc., P. O. Box 279, Poplar Bluff, Mo. CA $2,744,193. grade, bridges pave two 24 ft., 168 mi. US 66, Pulaski, and Laclede Counties. Bids Dec. 2, awarded Dec. 16. CD 12/7, under LB.

† **Roten Constr. Co.**, P.O. Box 445, North Little Rock, Ark., CA, $339,750, est. $359,848, Headquarters and Operation Bldgs. B-47 and KC-97, Little Rock Air Force Base, ENG-03-050-55-54, JACKSONVILLE, ARK. U. S. Eng., P.O. Box 867, Little Rock, Ark. Bids Dec. 16, awarded Dec. 17. CD 11/12.

▲ **NEBRASKA**—State Dpt. Roads & Irrigation, Lincoln,

Missouri Valley Constr. Co., Omaha Natl. Bank Bldg., Omaha, Neb., LB $641,468, grading, sta. gran. shoulder, stabil. soil base, stab. shoulders, traffic control signals, FA-F-147 and I-Kimball-Potter, Kimball Co.; LB $746,515, grading, detour, paving, culvert, sedding, bridge, guard rail, FA-F-453 and S-219, Syracuse-Tecumseh; LB $210,275, grading, gravel, detour, guard rail, stabil. soil, subgrade, shouldering, asph. concrete, FA-F-456 and S-573, Alma-Franklin, Bloomington north, Franklin Co.;

Peter Kiewit Sons Co., Omaha Natl. Bank Bldg., Omaha, Neb., LB $391,907, grading, paving, culvert, seeding, traffic controls, FA-S-147 72nd St. in and near Omaha, Douglas Co. Bids Dec. 16. CD 12/8.

▲ **NEBRASKA**—State Dpt. Road & Irrigation, Lincoln,

W. A. Lynn Constr. Co., 1022 Trust Bldg. and **Roberts Constr. Co.**, 1018 Trust Bldg., Lincoln, Neb. LB $1,341,985, grading, paving, culvert viaduct, FA-FG-1 [illegible] St. in Lincoln, Lancaster Co.;

Missouri Valley Constr. Co., Omaha Natl. Bank Bldg., Omaha, Neb., LB $176,365, culverts, FA-F-147 and I-316, Kimball-Potter, Kimball Co.;

Midland Constr. Co., 8402 Maple St., Omaha, Neb., LB $120,936, bridge, FA-S-147—72nd St. in and near Omaha, Douglas Co.;

Diamond Eng. Co., Grand Island, Neb., LB $75,083, bridges and guard rail, FA-S-340-Fairbury-Odell, Jefferson Co. Bids Dec. 16. CD 12/8.

▲ **Great Lakes Pipe Line Co.**, Bryant Bldg., Kansas City, Mo. Owner Builds. $3,000,000. 162 mi. 10 in. pipe line for gasoline and fuel oils from refineries, expansion, pumping stations, ElDorado to Kansas City, KANSAS.

† **T. C. Bateson Constr. Co.**, Box 7305, Inwood Station, Dallas, Tex. LB $666,204. group buildings, Smoky Hill Air Force Base, SALINA, KAN. U. S. Eng., 601 Davidson Bldg., Kansas City 6, Mo. Bids Dec. 14. CD 11/18.

† **Scrivner & Richardson**, P.O. Box 906, Aransas Pass, Tex., CA $612,175, repairing the south jetty, Port Aransas-Corpus Christi Waterway near town of Port Aransas, Nueces Co., CIVENG 18, TEXAS. U. S. Eng., 606 Santa Fe Bldg., Galveston, Tex. Bids Dec. 14, awarded Dec. 13.

Mitchell Darby Constr. Co., Box 447, Pharr, Tex., LB $379,891, Contr. 3, sanitary sewer lines, GROVES, TEX. City, Groves, Tex. Bids Dec. 15. CD 12/8.

COLORADO—State Hy. Dpt., 518 State Office Bldg., Denver,

Schmidt Constr. Co., Grand Junction Colo., CA, $412,196 est. $388,807, plant mix asph. surf. 5.931 mi. State Hy. No. 4, Una and Grand Valley Proj. F 001-1 (1), Garfield Co. Bids Dec. 17. CD 12/8.

COLORADO—State Hy. Dpt., 518 State Office Bldg., Denver,

Alger Constr. Co., Pueblo, Colo., CA, $181,101, est. $208,321, plant mixed asph. surf. 3.227 mi. Pueblo and Walsenburg, Colo. Proj. No. FI 002-3 (13), Pueblo Co.;

Colorado Constructors, Inc., 725 E. 39 Ave., Denver, Colo., CA, $166,464, est. $183,075 plant mix asph. surf. 6.481 mi. Wray and Eckley, Colo. Proj. F 001-1 (5), Yuma Co. Bids Dec. 16. CD 12/8.

COLORADO—State Hy. Dpt., 518 State Office Bldg., Denver,

Peter Kiewit Sons Co., 1950 South Colorado Blvd., Denver, Colo., CA, $272,117, est. $290,551 grading, stab., structures, asph. surf. 7.877 mi. Cortez, Colo. Proj. C 20-0019-11, La Plata Co. Bids Dec. 15. CD 12/8.

NEW MEXICO—State Hy. Comn., Capitol Bldg., Santa Fe,

J. H. Ryan & Son, Inc., 1872 Five Points Rd. S.W., Albuquerque, N. M., LB $274,847. three concrete, steel bridges, one 128.84 ft., one 525.67 ft., one 382.97 ft. and placement steel guard rail on existing structures 0.196 mi. U. S. 85 between Algodones and La Bajada, FAP No. IN-001-4 (6) and SP IN-001-4 (403), Sandoval Co.; LB $206,833, one 4-span concrete steel bridge 398.34 ft. long and approaches of grading, drainage, leveling course, bit. sur., curb and utter and misc. constr. 0.427 mi. St. Rd. 239 in City of Carlsbad on N. Canal St., FAP No. U-120-1 (1), Eddy Co. Bids Dec. 17. CD 12/8.

▲ **NEW MEXICO**—State Hy. Comn., Capitol Bldg., Santa Fe,

Henry Thygesen & Co., 424 Kinley Ave. N.E., Albuquerque, N. M., LB $716,352, ballast, leveling course, hot plant surf., curb and gutter one 3-span concrete, steel railroad overpass 192.52 ft. long, widening one concrete, steel bridge and misc. constr. 5.876 mi. US 54-70 from junction U. S. 54 and U. S. 70 north through Alamogordo to junction U. S. 54-70 and St. Rd. 83, FAP No. F-020-1 (1), U-020-1 (2) and SP F-020-1 (400), Otero Co.;

Brown Contr. Co., 3525 4th St., N.W., Albuquerque, N. M., LB $306,623, grading, drainage, watering, 4 multiple opening concrete box culverts and misc. constr. 6.569 mi. St. Rd. 422 from Menaul Blvd. in Albuquerque-North. FAP No. FI-001-4 (3), Bernalillo Co.;

Armstrong & Armstrong, Roswell, N. M., LB $163,422, base course, hot plant asphaltic pavement, misc. constr. 1.741 mi. U. S. 70-80 from Las Cruces-West, FAP No. F-002-2 (4), Dona Ana Co.; LB $107,980, ballast, leveling course, hot plant surf., misc. constr. 0.994 mi. U. S. 70 in City of Roswell on W. 2nd St., FAP No. U-021-2 (2), Chaves Co.;

Floyd Haake, Agua Fria, Santa Fe, N. M., LB $167,455, ballast, leveling course, hot plant pavement, two multiple opening concrete box culverts, one precast concrete bridge 76.36 ft. long, 3.023 mi. U. S. Hy. 666 between Gallup and Shiprock, FAP No. FLHP 12 (1), McKinley Co. Bids Dec. 17. CD 12/8.

BUILDINGS

LOW BIDS AND CONTRACTS

D'Arcy Leck Constr. Co., 2828 Stevens Ave., Minneapolis, Minn. CA $350,000. general contract 1 story, 135,000 sq. ft. FACTORY-OFFICE, East River Rd. and 37 Ave. N.E., MINNEAPOLIS, MINN. Hoerner Boxes of Minneapolis, 1325 Quincy St. N.E., Minneapolis, Minn. Bids Nov. 26. CD 11/23.

Winn-Senter Constr. Co., Railway Exchange Bldg., Kansas City, Mo. CA Est. $600,000. 30,000 sq. ft. brick pharmaceutical PLANT, Westport Rd. and Mill St., KANSAS CITY, MO. Abbott Laboratories, c/o H. S. Wilkinson, operator, 2020 Grand St., Kansas City, Mo. Chas. E. Keyser, 609 Minnesota Ave., Kansas City, Kan., archt.

▲ **Fleit Constr. Co.**, 4325 Troost St., Kansas City, Mo. CA Est. $130,000,000. 1 and 2 story, masonry STORE, OFFICE, and roof parking proj., 18 and Baltimore-Main Sts., KANSAS CITY, MO. Oppenheimer Industries, c/o Harold L. Oppenheimer, 1615 Baltimore St., Kansas City, Mo.

J. A. Lundgren & Son, 213 Jackson St., Topeka, Kan. LB $410,950. general contract National Guard ARMORY, TOPEKA, KAN. State, Dpt. Admin., Topeka, Kan. Bids Dec. 7. CD 11/24.

▲ **Combustion Engineering, Inc.**, 200 Madison Ave., New York, N. Y., CA $3,179,896, STEAM GENERATOR and auxiliary equip. at Florence Station, OMAHA, NEB. Omaha Public Power Dist. 17 and Harney Sts., Omaha, Neb. Pioneer Service & Eng. Co., 231 S. LaSalle St., Chicago, Ill., engr. A. G. Johnson, c/o owner, ch. engr. Bids Nov. 30. CD 11/10.

John Broad Constr. Co., Box 862, Austin 65, Tex. CA $562,000, renovating, remodeling OFFICE, AUSTIN, TEX. Plymouth Life Insurance Co., 7 and Colorado Sts., Austin, Tex. CD 7/8.

▲ **Meyerland Co.**, c/o Thomas A. Robinson, Jr., 510 Taft St., Houston, Tex., Own Forces. $339,350, 18 DWELLINGS; $338,000, 26 DWELLINGS; $358,750, 28 DWELLINGS all in Second Sect., BELLAIRE, TEX. Grand total $1,036,100. CD 7/26.

Sluss Constr. Co., Box 3409, Big Spring, Tex. LB $683,000 HIGH SCHOOL, Job No. 1200, BIG LAKE, TEX. Reagan County Independent School Dist., Big Lake, Tex. Bids Dec. 14. CD 11/24.

Mayflower Investment Co., c/o Bob Brady, c/o Carr P. Collins, 913 Commerce St., Dallas, Tex., Own Forces. $398,000, (G) 45 DWELLINGS, DALLAS, TEX. CD 7/28.

Centex Constr., 4911 Greenville St., Dallas, Tex. Own Forces. $385,515, Group 12, 38 DWELLINGS, GRAND PRAIRIE, TEX. CD 11/18.

▲ **Glenbrook Development Corp.**, R. L. Bradley Jr. & Assocs., 7445 Park Pl. Blvd., Houston, Tex. Own Forces. $350,000. Group 1, 25 DWELLINGS; $315,500, Group 2, 12 all-masonry DWELLINGS; $345,150, Group 3, 16 DWELLINGS, HOUSTON, TEX. Grand total $1,010,650. CD 12/2.

▲ **Marshall Constr. Co.**, 4009 Center St., Houston, Tex. CA $1,000,000. 3 story STORE addn., HOUSTON,

(Continued on page 128)

DRILLING COSTS CUT IN HALF with this JOY TRAC-DRILL

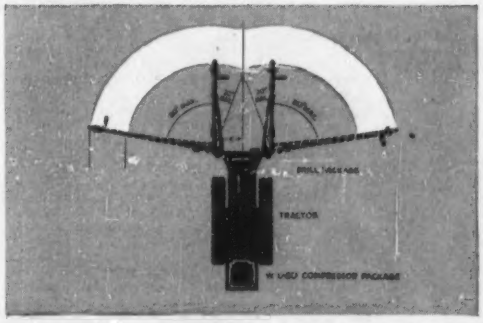
56%, TO BE EXACT was this contractor's reduction in drilling costs on his Missouri highway job, with the Joy Trac-Drill.

"STAY AHEAD OF THE SHOVELS," was the order. But *four* wagon drills driven by *two* compressors couldn't do it. Even with overtime . . . a long ten-hour day . . . the seven-man crew (four drillers, two helpers, one compressor operator) couldn't meet production.

A JOY TRAC-DRILL PACKAGE was mounted on a used tractor along with a Joy WL-80 Compressor Package. (Joy furnished complete instructions.) The rig worked like a charm. It easily led the shovels . . . and with only *four* men—two drillers, one helper and a tractor operator. The unit was completely self-contained and maneuverable. The B-I-G savings show up in the contractor's weekly cost figures:

	4 WAGON DRILLS	JOY TRAC-DRILL
Labor	$ 810	$500
Depreciation (3-yr.)	212	145
Fuel	140	86
Total	$1160	$730
Performance (week)	7200 ft.	10,200 ft.
Cost—foot of hole	16¢	7¢

THE TRAC-DRILL PACKAGE INCLUDES twin drills and feeds mounted on Joy Hydro Drill Jibs (hydraulically-actuated booms with power lift and power swing). Because the jibs are extensible, the Trac-Drill can reach out to put many holes in a straight line, if necessary, from one tractor setup. A used tractor, past its prime can thus be converted to an ace drilling machine. The whole story is in our Bulletin M-214, free for the asking. Just write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*



Each Hydro Drill Jib on the Joy TRAC-DRILL operates in a 100° arc making it possible with extensible 10' Jibs to drill to a 42' width.

Consult a Joy Engineer

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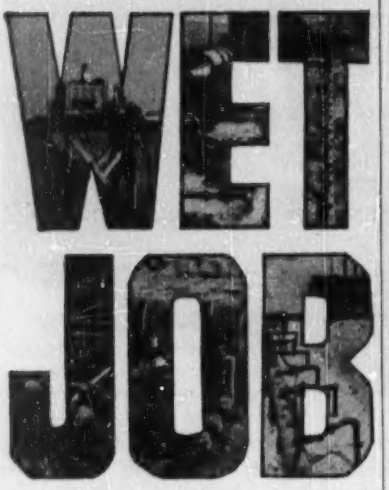

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(Continued from page 126)

TEX. Sunland Furniture Co., 2817 Main St., Houston, Tex. Cato, Austin & Evans, 2401 LaBranch St., Houston, Tex., archts. Robert J. Cummins, Bankers Mortgage Bldg., and Dale Cooper Assocs., 420 Sul Ross St., Houston, Tex., engrs. CD 10/19/53.

H. K. Perry, 4906 Gren St., Houston, Tex. Own Forces. $328,125, 24 DWELLINGS; $357,700, 32 DWELLINGS, HOUSTON, TEX. CD 11/30.

Mayflower Co., Bob Brady, mgr., Irving, Tex. CA $775,000. SHOPPING CENTER, IRVING, TEX. Mayflower Investment Co., Irving, Tex. Wyatt C. Hedrick, 904 Fort Worth Ave., Dallas, Tex., engr.-archt. CD 12/22.

Connell Constr. Co., 2110 Hawes St., Dallas, Tex., CA $335,000, 24 DWELLINGS; CA $348,625, 31 DWELLINGS, MESQUITE, TEX. C. Lee Connell, National City Bldg., Dallas, Tex. CD 12/1.

A. L. Hays & Sons, Box 9321, Houston, Tex., LB $668,572 est. $625,000, two elementary SCHOOLS, one at Port Neches and other at Groves, PORT NECHES, TEX. Port Neches Independent School Dist., Port Neches, Tex. Bids Dec. 9. CD 11/24.

Edgar Von Schoele & Co., 2015 West Ave., San Antonio, Tex., Own Forces. $346,215, 27 brick, frame DWELLINGS; $389,100, 23 all-masonry DWELLINGS, SAN ANTONIO, TEX. CD 9/2.

Haby Ceay, Contractor, 833 Bandera Rd., San Antonio, Tex. Owner Builds. $325,000, 19 frame, masonry DWELLINGS; $336,735, 24 frame and brick trim DWELLINGS, SAN ANTONIO, TEX. CD 9/2.

Farnsworth & Chambers Co., Inc., Box 74, Houston, Tex. LB $929,000. 4 story, bsmnt., 100-bed, steel, brick, stone county HOSPITAL, VICTORIA, TEX. Victoria Co., Court House, Victoria, Tex. Bids Dec. 16. CD 11/10.

† Kay-Cee Constr. Co., 2647 W. Lawrence Ave., Chicago 25, Ill., LB $521,000, alterations, imprvs. to KITCHEN, DINING HALL, Veterans Admin. Center, WACO, TEX. U. S. Govt., Veterans Admin., Munitions Bldg., Wash. 25, D. C. Bids Dec. 14. CD 11/1.

Gruber & Sons, 447 Julian St., Denver, Colo., Owner Builds, $475,000. 3 story, full bsmnt. APARTMENT, DENVER, COLO. Charles D. Strong, 933 Sherman St., Denver, Colo., engr.-archt.

Stalder & Son, 1010 Corona St., Denver, Colo., Owner Builds, $900,000, 7 story, 39,000 sq. ft. OFFICE, DENVER, COLO. T. J. Moore, 2052 South Fillmore St., Denver, Colo., engr. and archt.

George Rutherford, 915 Mazeldine Ave. S.E., Albuquerque, N. M., CA $647,000. SENIOR HIGH SCHOOL, GRANTS, N. M. Bd. Educ., Grants, N. M. Bids Nov. 30. CD 12/22, under LB.

FAR WEST

BIDS ASKED—HEAVY CONSTRUCTION

▲† Ariz., Tucson—HANGAR ACCESS APRON, etc.—BA 1/12—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., hangar access apron, parking apron, blast pad, Davis-Monthan Air Force Base, ENG-04-353-55-65, $1,000,000. CD 5/12/51.

▲† Wash., Fort Lewis—HOUSING, etc.—BA 1/27—U. S. Eng., 4735 E. Marginal Way, Seattle, Zone 4, 117 two story brick, frame permanent housing buildings, with streets, utilities, Inv. 55-93, Over $10,000,000. Plans deposit $50. CD 11/7/51.

BIDS ASKED—BUILDINGS

Calif., Oxnard—OFFICE—BA 1/18—Ventura Co., 501 Poli St., Ventura, and City, City Hall, 3 story Type I, 140x139 ft., city-county office. $500,000. Kenneth H. Hess, 620 E. Main St., Ventura, archts. CD 8/17.

SOON LETS CONTRACT—BUILDINGS

▲ Calif., Los Angeles—FACTORY—Airesearch Mfg. Co., 9851 Sepulveda Blvd., soon lets contract, 73,000 sq. ft. factory addn. $1,000,000. Welton Becket & Assoc., 5657 Wilshire Blvd., archts.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

† Otis Williams & Co., Kennewick, Wash., LB, $526,732, est. $616,279, earthwork, canal lining, structures for Main Canal, Station 766 plus 50 to 1300 plus 00 Sch. 1, utilizing monolithic concrete in all siphons, Yakima Proj., Spec. 4281, WASHINGTON. Bureau Reclamation, Dpt. Interior, Kennewick, Wash. Bids Dec. 14. CD 11/29.

Osberg Constr. Co., 1132 N. 128 St., Seattle, Wash., CA $174,759, b. conc. Tumwater access road; asph. paving Front, Valley and Cherry Sts. and filling, draining, ballasting alley between Front and 1 Sts. from Oak to Valley Sts.;

Pieler Constr. Co., Shafer Bldg., Seattle 1, Wash., CA $184,303, paving Marine Dr., precast concrete bridge over lagoon waterway;

F. N. Jarnagin, Port Angeles, Wash., CA $92,383 paving Front Valley and Cherry and alley between Front and 1 Sts., PORT ANGELES, WASH. City, City Hall, Port Angeles, Wash. Grand total $451,445. Bids Dec. 16. CD 12/9.

▲ Standard Oil Co. of California, 225 Bush St., San Francisco, Calif., Day Labor, $1,000,000 wharf with pipe lines and warehouse, SEATTLE, WASH. CD 8/18.

Pacific Dredging Co., Box 227, Long Beach, Calif., CA $984,404, imprvt. Rainbow Pier Lagoon area, LONG BEACH, CALIF. City, City Hall, Long Beach, Calif. Bids Nov. 29. CD 12/6/44.

Stolte, Inc. & Morrison-Knudsen, Inc., 8451 San Leandro St., Oakland, Calif., CA, $553,016, est. $500,000 Proj. 216, Ruby Canyon Storm Drain, Monrovia, LOS ANGELES, CALIF. Los Angeles Co. Flood Control Dist., 2250 Alcaar St., Los Angeles, Calif. Bids Dec. 3. CD 12/13, under LB.

† Standard Dredging Co., 108 W. 6 St., Los Angeles, Calif., LB, $640,900, dredging entrance channel to Mission Bay, San Diego, CIVENG-04-353-55-22, CALIFORNIA. U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif. Bids Dec. 15. CD 12/7.

BUILDINGS

LOW BIDS AND CONTRACTS

Wall, Bertram & Sanford, Junction City, Ore., CA, $736,047, 7 rein.-con. HIGH SCHOOL BLDGS. ELLENSBURG, WASH. School District 401, Ellensburg, Wash. Bids Nov. 23. CD 11/30, under LB.

La Mirada Woods Bldg. Co., 1169 E. 58 St., Los Angeles, Calif. Owner Builds, $836,400 82 frame, stucco DWELLINGS, Barwood Dr. and Elmbrook St., BELLFLOWER, CALIF.

Cannon Constr. Co., 34 and Union Ave., San Diego, Calif., CA $400,000, 50 frame, stucco DWELLINGS, Bucknell and Acacia Aves., SAN DIEGO, CALIF. East Nile Development, Inc., 34 and Union Ave., San Diego, Calif.

O. D. Arnold & Sons, 6122 E. Cajon Blvd., San Diego, Calif. Owner Builds, $404,100. 38 frame stucco DWELLINGS in Hazelwood Heights, Tract No. 3, SAN DIEGO, CALIF.

CANADA

BIDS ASKED—BUILDINGS

Ont., London—DINING HALL—BA 1/22—University of Western Ontario, London, 2 story, bsmnt., 115x150 ft., stone dining hall. $700,000. O. Roy Moore, 260½ Dundas St., archt. CD 9/22.

SOON LETS CONTRACT—BUILDINGS

B. C., South Burnaby—SUPERMARKET—Canada Safeway Ltd., 840 Cambia St., Vancouver, soon lets contract, 1 story, 125x154 ft., concrete, glass block, supermarket, Kingsway and Edmonda Sts. $500,000.

HEAVY CONSTRUCTION

LOW BIDS AND CONTRACTS

British Ropeways Ltd., London, England, CA $900,000 aerial tramway at mining development 60 mi. south of Yukon border, CASSIAR, B. C. Cassiar Asbestos Corp., Cassiar, B. C. A. C. Coon, c/o owner, engr. CD 11/17.

BUILDINGS

LOW BIDS AND CONTRACTS

▲ Kelwood Commercial Corp. Ltd., c/o Clayton & Bond, archts., 204 Clark Bldg., Calgary, Alta. Owner Builds. $1,400,000, SHOPPING CENTER, 17 Ave. and 37 St. in Glendale Subdivision, CALGARY, ALTA. CD 12/20.

Christenson & MacDonald, 618 Tegler Bldg., Edmonton, Alta., CA, $421,124, ALCOHOLIC REHABILITATION CENTER, EDMONTON, ALTA. Province of Alberta, Edmonton, Alta. CD 4/5.

Baynes Manning Ltd., 2210 West 12 Ave., Vancouver, B. C., CA $614,258, Junior HIGH SCHOOL, Strathmore St., NANAIMO, B. C. School Dist. No. 68, Nanaimo, B. C. Bids Nov. 30. CD 12/15, under LB.

▲ Canadian Bridge Co. Ltd., Walkerville, Ont., CA, steel for galvanized line bldg.;

Dominion Structural Steel Ltd., 57 Bloor St. W., Toronto, Ont., CA, steel for strip MILL, HAMILTON, ONT. Total est. $3,500,000. Dominion Foundries & Steel Ltd., Depew St., Hamilton, Ont. Prack & Prack, 310 Main St. E., Hamilton, archts. Awarded Dec. 13. CD 7/21.

Arnold Constr. Co., Ltd., 42 N. James St., Hamilton, Ont., CA, $400,000, 2 story, bsmnt., concrete, brick OFFICE, West Main St., HAMILTON, ONT. Ontario Hydro-Power Comn., 620 University Ave., Toronto, Ont. CD 3/25.

Burmarden Holding Corp. Ltd., 205 Yonge St., Toronto, Ont. Owner Builds, $400,000, 10 story, 80x102 ft., stilt-type 50-suite APARTMENT, Oxton Ave. and Oriole Parkway, TORONTO, ONT. Page & Steele, 72 St. Clair Ave. W., Toronto, Ont., archts.

R. Matte Ltd., 5245 Van Horne Ave., Montreal, Que., CA, $436,000, concrete, steel, brick FACTORY VILLE LA SALLE, QUE. Sani Pulp Corp., 7749 Aqueduct Blvd., Ville La Salle, Que. A. Gravel, 1180 E. Sherbrooke St., Montreal, Que., archt.

▲ Erko Development Corp., P.O. Box 99, St. Bruno, Que., Owner Builds, $5,000,000. 500 dwelling unit HOUSING DEVELOPMENT, ST. BRUNO, QUE.

ALASKA

BUILDINGS

LOW BIDS AND CONTRACTS

† Peter Kiewit Sons' Co., 1300 Aloha St., Seattle, Wash. LB $965,160, est. $910,187, indoor training facility, enlisted men's service CLUB conversion of existing barracks, Inv. 55-34, BIG DELTA, ALASKA. U. S. Eng., Anchorage, Alaska. Bids Dec. 17. CD 11/30.

† S. S. Mullen, Inc., 621 9th Ave. N., Seattle, Wash. LB $720,000. 2 story, rein.-con., steel CLASSROOM and GYMNASIUM addn. to high school, Proj. Aaa 50-A-45, KODIAK, ALASKA. Alaska P. Wks., Dpt. Interior, P. O. Box 1181, Juneau, Alaska. Bids Dec. 17. CD 11/9.

(Proposal Advertisements see pp. 133 to 135)

want high speed plus endurance? How's this...

1000 HOURS at 3600 R.P.M. UNDER FULL LOAD!

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While there is every reason to believe that this is a record-breaking endurance run (and don't forget it was made at 3600 R.P.M. under full load), we are confident that every Chrysler Industrial V8 Engine will *at least equal* this astounding record.

This proves too, beyond a doubt, that the Chrysler Industrial V8 hemispherical combustion chamber design with its short-stroke, low-friction construction, makes an ideal power plant for any equipment that requires continuous high speed operation. Furthermore, in installing a Chrysler V8 Engine in preference to a diesel engine of similar horsepower, you can reduce your size estimate by one-half, your weight by two-thirds, and your cost factor by three-quarters!

For detailed information on the Model 24A or any Chrysler Industrial Engine, see a Chrysler Industrial Engine Dealer, or write:
Dept. 912 Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.

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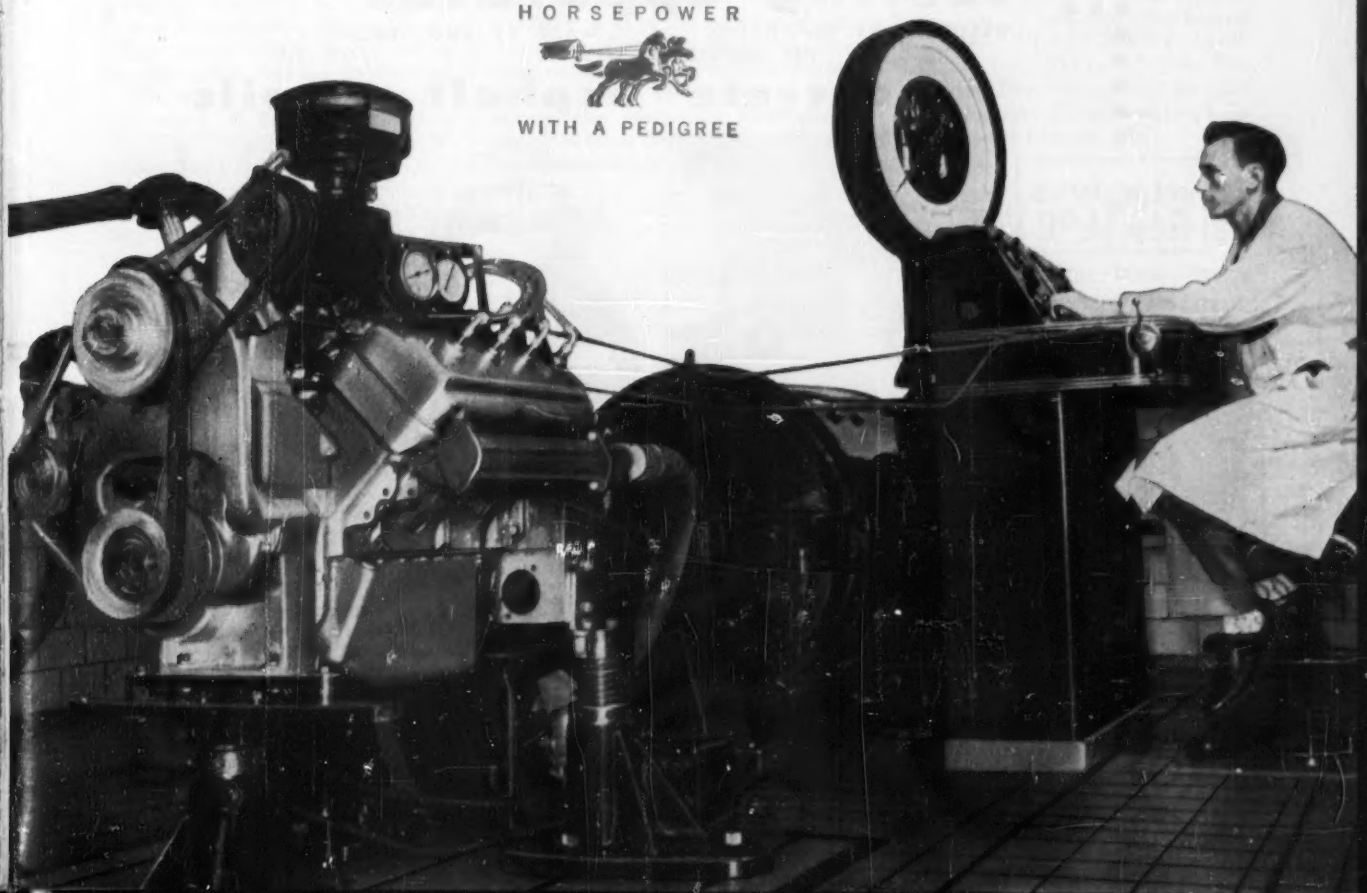

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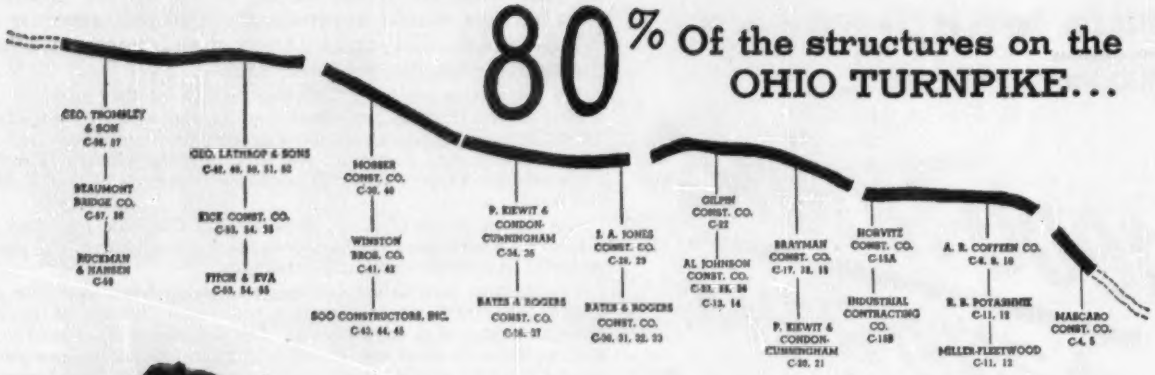
GEO. THOMSLEY & SON C-36, 37
BEAUMONT BRIDGE CO. C-37, 38
BUCKMAN & HANSEN C-60
GEO. LATHROP & SONS C-42, 46, 50, 51, 52
RICE CONST. CO. C-53, 54, 58
FITCH & EVA C-53, 54, 55
HOBBER CONST. CO. C-30, 40
WINSTON BROS. CO. C-41, 42
SOO CONSTRUCTORS, INC. C-43, 44, 45
P. KIEWIT & CONDON-CUNNINGHAM C-24, 26
BATES & ROGERS CONST. CO. C-25, 27
S. A. JONES CONST. CO. C-28, 29
BATES & ROGERS CONST. CO. C-30, 31, 32, 33
GILPIN CONST. CO. C-22
AL JOHNSON CONST. CO. C-23, 35, 36 C-13, 14
BRAYMAN CONST. CO. C-17, 18, 19
P. KIEWIT & CONDON-CUNNINGHAM C-20, 21
HORVITZ CONST. CO. C-15A
INDUSTRIAL CONTRACTING CO. C-15B
A. B. COFFEEN CO. C-8, 9, 10
R. B. POTASHNIK C-11, 12
MILLER-FLEETWOOD C-11, 12
MASCARO CONST. CO. C-4, 5

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MEN AND JOBS

Bridge Engineer Becomes Arkansas Highway Chief

William Ward Goodman, Little Rock, Ark., has been named chief engineer of the Arkansas Highway Department. He succeeds A. E. Johnson, recently appointed executive secretary of the American Association of State Highway Officials in Washington (ENR, Dec. 16, p. 60).

Goodman, who joined the highway department in 1927, received his engineering degree in 1930 from the University of Arkansas. He has worked continuously with the department except for brief periods during World War II when he was engaged in war plant construction at Pine Bluff, Ark., Charlotte, N. C., and Edmonton, Alberta.

Until his new appointment, Goodman has been serving as bridge engineer in charge of the bridge department.

New Officers Elected By Asphalt Institute

J. E. Buchanan was reelected president of The Asphalt Institute at its annual meeting in New York. Chairmanship of the Institute's executive committee went to H. B. Pullar, president of Berry Asphalt Co.

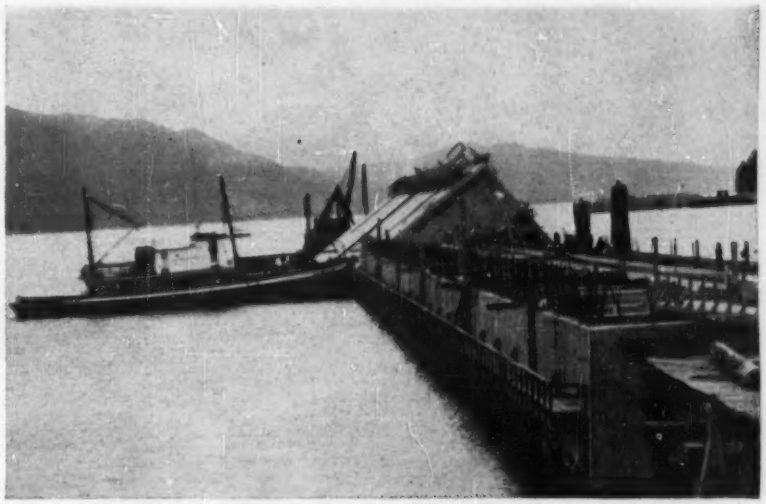
New vice presidents, serving on the executive committee and representing the Institute's five geographical divisions, are: F. R. Field (Esso Standard Oil Co.), Atlantic-Gulf Div.; E. V. Linder (Sinclair Refining Co.), Ohio-Great Lakes Div.; C. E. Defabaugh (Phillips Petroleum Co.), Mid-West Div.; D. C. Arnold (Texas Co.), Southwest Div.; N. H. Angell (American Bitumuls & Asphalt Co.), Pacific Div.

New Job, Old Friends

Henry L. Conger, engineer with Porter, Urquhart & Bevan, consulting engineers, Newark, N. J. is scheduled to become chief engineer for Skidmore, Owings & Merrill on the Colorado Springs Air Force Academy about Feb. 1. There he will work under Edward A. Merrill, the project manager.

The two men were associated in somewhat similar capacities on the Moroccan airbases, on which the above two firms, under the name of PUSOM as a joint venture, were the architect-engineers.

(*Men and Jobs continued on page 133*)



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Floating Plastiment-concrete structures are not new. . . . Of the seven American projects featured as Famous Floating Concrete Structures in the May issue of the Journal of the American Concrete Institute, five were constructed of Plastiment-concrete . . . most of the foreign jobs shown also contained Plastiment, supplied from the fourteen overseas Sika manufacturing organizations.

While you may not be designing a floating concrete pier, the special qualities that made this concrete denser, more uniform, and more resistant to cracking and abrasion are undoubtedly a must in your own construction projects. Performance has proven that Plastiment can help you attain this goal.

For the story on the Kitimat project, plus a detailed explanation of Plastiment's exclusive action on cement gels, write for your copy of Sika Job 14 and the illustrated brochure "PLASTIMENT CONCRETE DENSIFIER." Our Engineering Department will be glad to tell you how Plastiment can help you on your present job.

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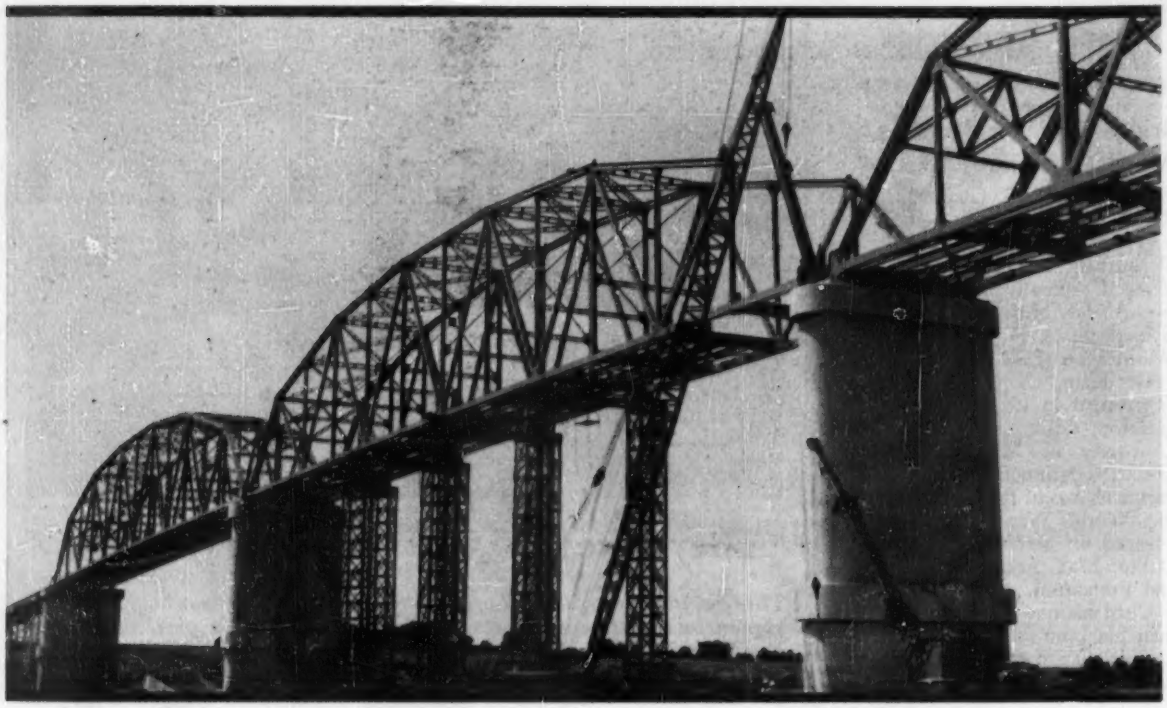

NEW BRIDGE TO SPAN RED RIVER IN LOUISIANA: Work nears completion on new highway bridge being erected for the Louisiana Department of Highways on State Route 109. The structure, located in Caddo and Bossier Parishes, spans the Red River at Miller's Bluff, Louisiana . . on the Plain Dealing-Hosston Highway. The super-structure consists of seventeen I-beam spans, each of which is seventy-five feet in length, and five through truss-spans, each measuring 360 feet in length. Steel for the new bridge, which has an over-all length of more than one-half mile, was fabricated and erected by Allied Structural Steel Companies.

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Men and Jobs Briefs . . .

• **Corps of Engineers**–Philadelphia's district engineer **Col. Robert J. Fleming Jr.**, goes to Boston as New England district engineer . . . **Col. Allen F. Clark, Jr.**, becomes district engineer at Philadelphia . . . **Col. E. B. Downing** is appointed district engineer at Memphis.

• **Careers**–Highway engineer **L. Sterling Hedgpeth**, U. S. Bureau of Public Roads, becomes chief of the specifications and materials section in the construction branch of the bureau–he's just returned from six years of road work with the aid-to-Turkey mission.

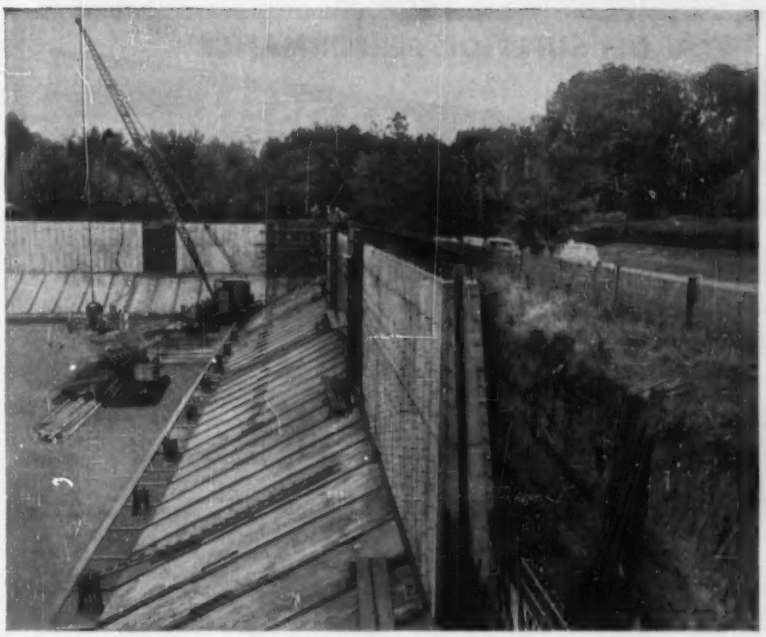
• **Associations** – Ohio Contractors' Assn. elects **Harry B. Fenton** as president . . . **N. R. Petry**, president of Petry Construction Co., Denver, becomes president of Associated Building Contractors of Colorado, Inc. . . . **Rudolph Norman** is elected president of New York State Association of Highway Engineers . . . **Lewis S. Shields** is named president of the Florida section of American Society of Engineers . . .

C. Raymond Hanes, Ohio Highway Department structural engineer, takes over in March as president of Ohio Society of Professional Engineers . . . **Ralph L. Shirmeyer** becomes president of Home Builders Association of Indiana . . . **Herbert E. Prater** heads up the Colorado section of ASCE–he's regional engineer with Bureau of Reclamation . . . **Mel J. London** joins the board of directors of AGC's chapter in northern California.

• **Business** – Bechtel Corp. elects **John R. Kiely** a director . . . **Russell Field**, recently associated with the Atomic Energy Commission, joins Holmes & Narver, Inc. as project engineer . . . **Thomas A. Lewis, Jr.** is appointed general manager of Concrete Products Co. of America, a subsidiary of American-Marietta Co. . . . **John R. Whitehead** becomes chief engineer of H. K. Ferguson Company's Cincinnati office . . . **L. Leslie Mullen** is elected executive vice president of Lehigh Structural Steel Co.

• **Retirements**–After 25 years of service, **John R. Hoffert**, from Pennsylvania's Bureau of Sanitary Engineering–he's been chief sanitary engineer since 1948 . . . **P. J. Bier** from the Bureau of Reclamation, after 30 years–now a consultant on penstock and steel pipe designs, specifications and inspections in Denver.

(*Advertisement*)



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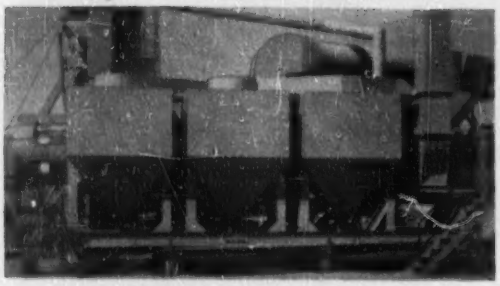

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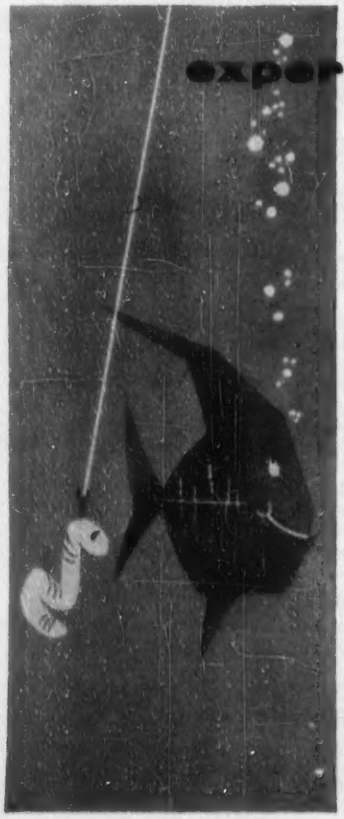

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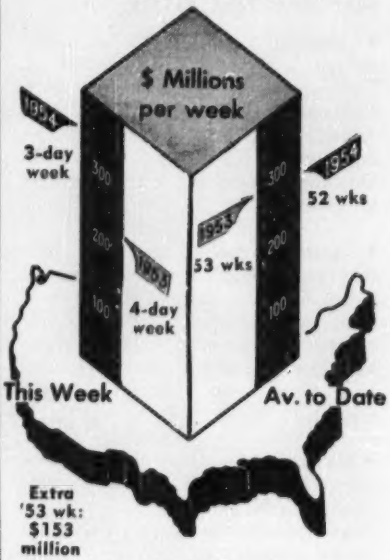
Activity This Week

As reported to ENR
(in millions of dollars)



Amount of contracts let

	This Week*	1954 53 wks	1953 53 wks	% chg based on 53 wks av wk
Federal	$19.6	$1,285.7*	$1,417.6	−8
State and municipal	128.1	5,001.0	5,088.0	+0.2
Total public	147.7	6 286.7*	6,505.6	−1.5
Total private	198.4	8,255.3*	8,665.3	−3
U. S. total	$346.1	$14,542.0	$15,170.9	−2

Contracts by type of work

Waterworks	$5.4	$245.4	$246.8	+1
Sewerage	5.7	387.9	431.1	−8
Bridges	15.4	510.3	752.1	−31
Highways	67.0	1,918.8	1,792.4	+9
Earthwork, waterways	14.7	338.7	374.5	−8
Buildings:				
Public, excl. hsg.	33.6	1,762.4	1,736.3	+3
Housg., public	0.0	255.1	375.2	−31
Housg., private	25.5	4,231.8	3,463.9	+25
Commercial	146.3	1,550.3	1,157.5	+37
Industrial	22.8	1,876.6†	3,178.5	−40
Unclassified	0.7	1,464.7	1,662.6	−10
Total	$346.1	$14 542.0	$15,170.9	−2

* 3-day week † Previous week revised

NOTE: Minimum size projects included are: Waterworks and waterways, $34,000; other public works, $60,000; industrial buildings, $82,000; other buildings, $300,000.

New capital for construction

(millions of dollars)	Week of Dec. 23 1954	Cumulative 51 Wks 1954	% chge '53-'54
Corporate securities	$7.3	$2,579.0	−40
State and municipal:			
All except housing	81.0	5,416.7	+27
Housing	...	91.0	−65
Federal loans	0.8	113.8	+1
Federal aid	...	673.0	−13
Total non-federal	$89.0	$8,873.5	−9
Federal appropriations:			
In U. S.	...	$2,073.3	+32
Outside U. S.	...	33.2	+15
Total new capital	$89.0	$10,980.0	−3

ENR cost and volume indexes, 1954

		Base years = 100 1913	1926	1949
Construction cost	12/23	644.02	309.58	135.01
	12/2†	643.31	309.24	134.86
Building cost	12/23	457.55	247.34	130.06
	12/2†	456.77	246.92	129.84
Volume	Nov.	522	212	151
	Oct.	423	172	122

† Official ENR index for Dec. 1.

OFFICIAL PROPOSALS

Bids: January 18, 1955

New Jersey Turnpike Authority

CONTRACT NO. N-26A

Proposals are invited for Contract No. N-26A which involves the construction of the substructure, consisting of twenty-five (25) piers, for the North Terminal Ramps-Section A, extending from just north of Second Street to just north of Ninth Street in Jersey City, Hudson County, New Jersey, and other incidental work, all in connection with the construction of the Newark Bay-Hudson County Extension of the New Jersey Turnpike.

The principal items of work include:

Open Founation Excavation	11,500 Cu. Yds.
Concrete	13,650 Cu. Yds.
Reinforcement-Steel	2,200,000 lbs.
Cast-In-Place Concrete Piles	125,000 Lin. Ft.

Proposals will be received at the New Jersey Turnpike Authority Administration Building, New Brunswick, New Jersey, until 11:00 O'Clock Eastern Standard Time on the morning of January 18, 1954, at which time and place said proposals will be publicly opened and read.

Each bidder must submit with his proposal a Contractor's Financial and Equipment Statement.

Contract documents may be examined during office hours after December 21, 1954, at the office of the Authority and at the office of the Consulting Engineers, Howard, Needles, Tammen & Bergendoff, 55 Liberty Street, New York 5, New York. Contract documents will be furnished upon payment of Fifteen Dollars ($15.00) for each set, upon application to the Authority. Contract documents are not required to be returned and the payment will not be refunded.

NEW JERSEY TURNPIKE AUTHORITY
Paul L. Troast, Chairman

December 21, 1954

Bids: January 18, 1955

Contract 399

MODIFYING THE STRUCTURE AT SHAFTS 19

SEALED BIDS will be received by the Board of Water Supply, at its offices, thirteenth floor, 120 Wall Street, New York City, until 11:00 A.M., Eastern Standard Time, on Tuesday, January 18, 1955, for Contract 399, for modifying the structure at Shafts 19 of the Delaware aqueduct in the Town of Mount Pleasant, Westchester County, New York. The work includes the casting and installation in the waterways of reinforced concrete blocks for weirs and sidewalls, the construction of a reinforced concrete vent chamber, the removal and relocation of vent piping, the removal and replacing of reinforced concrete roof covers, the furnishing and erection of a wire fence, and excavating, refilling, embanking, paving, masonry and other work incidental to or in connection with that mentioned above, all as set forth in the specifications.

No bid will be received and deposited unless accompanied by a certified check upon a National or State bank, drawn and made payable to the order of the Comptroller of the City of New York, in the amount of five thousand dollars ($5,000.00) for the proper execution of the contract.

At the above place and time the bids will be publicly opened and read. Pamphlets containing information for bidders, forms of bid and contract, specifications, contract drawings, requirements as to surety, etc., can be obtained in Room 1316 at the above address, upon application in person or by mail, by depositing the sum of five dollars ($5.00) in cash or its equivalent for each pamphlet. Within 30 days following the award of contract or rejection of bids, the full amount of such deposit will be refunded for each pamphlet submitted as a bid and a refund of four dollars ($4.00) will be made for each other pamphlet returned in acceptable condition. Arrangements will be made whereby prospective bidders desiring blueprints of the contract drawings for their own use may secure same, the cost thereof to be paid by them. For further particulars, apply at the office of the Chief Engineer at the above address.

IRVING V. A. HUIE, President, EDWARD C. MAGUIRE, HERBERT M. ROSENBERG, Commissioners, Board of Water Supply; BETTY COHEN, Acting Secretary.

Contractors Watch This Section —

for new projects. Publish your announcements through the proposal sections of *Engineering News-Record* and get their bids.

OFFICIAL PROPOSALS

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. DC-4323), will be received at Kennewick, Washington, until January 26, 1955, for furnishing labor and materials for Amon Pumping Plant, Wasteway, Siphon and Appurtenant Works, Kennewick Division, Yakima Project. Location near Kennewick, Washington. Principal items are: 96,000 cu. yds. excavation for roadways, canals and structures; 1,330 cu. yds. concrete; installing hydraulic turbine and pumps; furnishing and installing steel manifold, steel discharge pipe, butterfly valve and radial gates; and other work. Alternate schdeules provide for constructing the 78-inch didameter siphon of precast concrete pipe or of monoiithic concrete at the option of the bidder. Completion time 565 days. For particulars, address Bureau of Reclamation, P. O. Box 516, Kennewick, Washington; or Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Specifications No. DC-4236) will be received at Phoenix, Arizona, until February 3, 1955, for furnishing labor and materials for additions to Gila Substation, Parker-Davis Project, Arizona-California-Nevada. Location near Yuma, Arizona. Principal items are: 2,515 cu. yds. excavation; 325 cu. yds. reinforced concrete; 140,000 pounds furnishing and erecting steel structures; 12,000 pounds furnishing and installing metalwork; 2,130 lin. ft. furnishing and installing conduit; 15,800 lin. ft. installing conductors and cables; 226 assemblies, furnishing and installing insulator assemblies; and other work. Completion time 360 days. For particulars, address Bureau of Reclamation, P. O. Box 392, Phoenix, Arizona; or Building 53, Denver Federal Center, Denver, Colorado. W. A. Dexheimer, Commissioner.

Sealed bids in triplicate for completion of fourth floor, Robert A. Taft Sanitary Engineering Center, Tusculum Avenue, Cincinnati, Ohio, will be received until 2:00 P.M., CT January 20, 1955, in Rm. 575 U. S. Court House, 219 South Clark St., Chicago 4, Ill., and then publicly opened in Rm. 575. Bidding material may be obtained Public Buildings Service, Rm. 1304 General Services Bldg., Washington 25, D. C., or General Services Administration, Office of Regional Director, Rm. 528 U. S. Court House, 219 South Clark St., Chicago 4, Illinois. Two sets of drawings and specifications may be obtained by general contractors interested in bidding the complete project. Two additional sets may be obtained by depositing $20.00 per set.

OFFICIAL PROPOSALS

Bids: January 19, 1955

Indiana Toll Road Commission
309 W. Washington Street
Old Trails Building
Indianapolis, Indiana

NOTICE TO BIDDERS
Contract C-1
Contract C-2
Contract C-1 and C-2

Sealed proposals will be received by the Indiana Toll Road Commission at or before 11:00 A.M., Central Standard Time, January 19, 1955, for the performance of each of the contracts enumerated above.

Contract No. C-1

The grading, drainage, structures and paving of approximately 2.7 miles in Construction Section C-1 of the Indiana East-West Toll Road beginning at a point about 700 feet east of the Indiana State Line at Toll Road Centerline Station 244+98.47 in Lake County and extending southerly to a point about 500 feet south of Wolf Lake at Toll Road Centerline Station 386+00 in Lake County, Indiana. The approximate quantities of the major items of construction are as follows:

Common Excavation	7,700 Cu. Yds.
Borrow	1,066,000 Cu. Yds.
10" Reinforced Concrete Pavement	76,900 Sq. Yds.
Culvert Pipes and Underdrains	2,300 Lin. Ft.
Cast-in-Place Concrete Piling	32,900 Lin. Ft.
Concrete for Structures	6,100 Cu. Yds.
Reinforcing Steel	1,357,000 Lbs.
Fabricated Structural Steel	3,261,000 Lbs.

Contract No. C-2

The grading, drainage, structures and paving of approximately 2.1 miles in Construction Section C-2 of the Indiana East-West Toll Road beginning at a point about 500 feet south of Wolf Lake at Toll Road Centerline Station 386+00 in Lake County and extending southerly to a point about 700 feet east of Calumet Avenue at Toll Road Centerline Station 497+30.43 in Lake County, Indiana. The approximate quantities of the major items of construction are as follows:

Common Excavation	47,000 Cu. Yds.
Borrow	1,244,000 Cu. Yds.
10" Reinforced Concrete Pavement	67,000 Sq. Yds.
Culvert Pipes and Underdrains	5,800 Lin. Ft.
Cast-in-Place Concrete Piling	35,700 Lin. Ft.
Concrete for Structures	7,400 Cu. Yds.
Reinforcing Steel	1,299,000 Lbs.
Fabricated Structural Steel	3,502,000 Lbs.

The work covered by Contract C-1 and C-2, which covers a combination of Construction Sections C-1 and C-2, is the construction as above described for the individual Construction Sections, taken together.

Copies of the Plans, Specifications and Proposal Forms for said Contracts are available for public inspection or purchase at the office of the Chief Engineer, Indiana Toll Road Commission, 309 W. Washington Street, Indianapolis, Indiana. These documents may be purchased from said Chief Engineer for the following sums, per set, which sums are non-returnable:

Standard Specifications for the Indiana East-West Toll Road	$ 5.00
Plans, Special Provisions and Proposal Forms, per set, per Construction Section	$25.00
Informational Drawings	
Cross-Sections, per set, per Construction Section	$25.00
Soil Plan and Profiles, per set, per Construction Section	$ 5.00

All Proposals must be on the form prescribed by the Commission and must comply with the terms and conditions set forth in the Contract Documents.

Contractor's statement for qualification on the forms supplied by the Commission will be required from all Bidders.

Each Proposal must be accompanied by a Proposal Guaranty in the amount of five (5%) percent of the total price bid per Construction Section covered by the Contract. If the Bidder shall tender bids for two or more Contracts which include the same Construction Section, the Construction Section thus duplicated in the bidding need be counted only once in determining the total amount of the Proposal Guaranty. The Proposal Guaranty shall be in the form of an acceptable surety bond or a certified check on a solvent bank.

If the Bidder is an out of state corporation, he shall be required to furnish a certificate from the Secretary of State of Indiana as evidence that the corporation has complied with the Indiana Foreign Corporation Statutes, and that the corporation is authorized to transact business in the State of Indiana.

All bids must be received at or before 11:00 A.M., Central Standard Time, January 19, 1955, in the offices of the Indiana Toll Road Commission, 309 W. Washington Street, Indianapolis, Indiana. At said hour, the bid box will be publicly opened and the bids read.

The award of any of the above-enumerated Contracts, if any award be made, will be to the Bidder or Bidders whose Proposal or combination of Proposals is lowest and best for the performance of the work, taken as a whole, and complies with all the prescribed requirements. The Commission reserves the right to reject any or all Proposals and to waive technicalities.

INDIANA TOLL ROAD COMMISSION
Dr. Dillon Geiger
Chairman

Charles W. Keating
Secretary-Treasurer

(Continued on following page)

OFFICIAL PROPOSALS

(Continued from preceding page)

Bids: January 18, 1955

Sewage Treatment Project of The Municipal Authority of the City of McKeesport

McKeesport, Allegheny County, Pennsylvania

Sealed proposals will be received at the office of THE MUNICIPAL AUTHORITY OF THE CITY OF McKEESPORT, located at 520 Walnut Street (Room 203), McKeesport, Pennsylvania, until 10:00 A.M., E.S.T., January 18, 1955, and will be publicly opened and read shortly thereafter in the City of McKeesport Council Chamber, on the sixth floor of the Peoples Bank Building, Fifth and Walnut Streets, McKeesport, Pennsylvania, for furnishing all necessary labor, materials, and equipment, and performing all work for the Contracts noted herein.

Separate poropsals will be received upon seven (7) parts of the project as hereinafter indicated. Each proposal shall be accompanied by a certified check or bid bond in amount not less than ten (10) per cent of the bid total, all in accordance with the provisions contained in the Specifications.

Copies of the Contract Documents, including Drawings and Specifications will be on file for inspection purposes at the office of Gannett Fleming Corddry and Carpenter, Inc., 6218 Penn Avenue, Pittsburgh, Pennsylvania; also at the office of The Municipal Authority of the City of McKeesport, 520 Walnut Street (Room 203), McKeesport, Pennsylvania; and at the office of Gannett Fleming Corddry & Carpenter, Inc., 600 North Second Street, Harrisburg, Pennsylvania.

Copies of the Contract Documents, including Drawings and Specifications, not to exceed two (2) sets of any particular Contract to a prospective bidder, may be obtained only from that office of Gannett Fleming Corddry and Carpenter, Inc., that is located at 6218 Penn Avenue, Pittsburgh, Pennsylvania, (P. O. Box 5073, Pittsburgh 6, Pennsylvania), upon deposit of the following stated amounts for each set:

Contract One—CONSTRUCTION OF INTERCEPTING SEWERS, SEWAGE REGULATORS, FORCE MAINS, SIPHONS AND APPURTENANCES. $50.00

(Part A): Construction of the Upper Monongahela River Interceptor, Sewage Regulators, and Appurtenances.

(Part B): Construction of the Lower Monongahela River Interceptor, Sewage Regulators, Force Mains, Siphon, and Appurtenances.

(Part C): Construction of the Youghiogheny River Interceptor, Sewage Regulators, Force Mains, Siphon, and Appurtenances.

Contract Two—GENERAL CONSTRUCTION OF SEWAGE TREATMENT PLANT, OUTFALL SEWER, ROADS, PUMPING STATIONS AND APPURTENANCES. $50.00

Contract Three—PLUMBING WORK IN CONNECTION WITH CONSTRUCTION OF SEWAGE TREATMENT PLANT AND PUMPING STATIONS. $25.00

Contract Four—HEATING WORK IN CONNECTION WITH CONSTRUCTION OF SEWAGE TREATMENT PLANT AND PUMPING STATIONS. $25.00

Contract Five—ELECTRICAL WORK IN CONNECTION WITH CONSTRUCTION OF SEWAGE TREATMENT PLANT AND PUMPING STATIONS. $25.00

Full refund will be made to actual prime bidders only for return of one of each set in good condition within ten (10) calendar days after closing date for receipt of bids; refund for return of all other sets, in good condition, within the same period, will be fifty (50) per cent of deposit.

NOTE: Bidder may submit proposals on any or all of the three (3) parts of Contract One as separate Contracts, and/or he may submit a proposal on all three (3) parts combined as one Contract.

THE MUNICIPAL AUTHORITY OF THE CITY OF McKEESPORT
520 Walnut Street (Room 203)
McKeesport, Pennsylvania
Gannett Fleming Corddry & Carpenter, Inc., Engineers,
6218 Penn Avenue
P. O. Box 5073
Pittsburgh 6, Pennsylvania

SEARCHLIGHT SECTION

(Classified Advertising)

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$1.80 a Line, minimum 3 lines. To figure advance payment count 5 average words as a line.

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STRUCTURAL STEEL CHECKERS

Must be experienced Detailers and Checkers in Structural Steel Fabrication

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Top Pay, Paid Vacation, Paid Holidays, Group Insurance Plan, Etc.

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Housing Available in Orange, Texas:

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For conducting laboratory and field investigations on highway materials and pavements. One an experienced engineer preferably under 40 having at least 5 years research and development experience in concrete and soils including planning of investigations and report writing. Experience in measuring minute strains and deflections desirable. And one a recent graduate with distinct interest in research and development having training in soils or having one or two years experience in highways, preferably on subgrades or base courses. Salaries open, suburban Chicago location.

P4930, Engineering News Record
520 N. Michigan Ave., Chicago 11, Ill.

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Men, if you have civil or architectural engineering degrees or equivalent training and experience in building construction, here is a stimulating challenge to utilize this knowledge in a sales capacity. Because we are expanding our MILCOR line of engineered metal products for the building industry, there are additional openings for qualified candidates in our sales training program. Excellent outlook for advancement. Salary open.

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Graduate Chemical, Mechanical, and Electrical Engineers with minimum of 5 years' experience. For specialized assignments commensurate with qualifications in various phases of project and process engineering. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 30

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$440 to $545 LOS ANGELES COUNTY FLOOD CONTROL DISTRICT AND COUNTY ENGINEER. One year's office engineering experience required. Apply by Jan. 6 for Sr. C.E. Assistant.

Write to L. A. County Civil Service, 501 N. Main St., L. A. 12, Calif.

WANTED
STRUCTURAL ENGINEER

With 5-10 years experience in steel and concrete design to work on design of pulp mill construction; Permanent position. Write: R. J. Kutchera, Chief Engineer

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CONCRETE PIPE Plant Superintendent with pressure and prestressed pipe experience capable of operating a large modern concrete pipe plant located in the South. Excellent opportunity for a top level production manager. Write fully, giving age, past experience, education, availability, salary requirements to P-4778, Engineering News-Record.

SURVEY PARTY Chief: Must be fully qualified to take charge of survey party on highway work. Write or call Garden 8-6695 for interview. Charles N. Savery Co., Cotuit, Cape Cod, Mass.

HEAVY CONSTRUCTION Engineer to design construction facilities and assist estimator. Applicant must be graduate engineer, preferably about 35 years old, with five years field experience on bridge or foundation work and five years as draftsman and designer on work of magnitude. Work in Pittsburgh office of nationally known, progressive contractor that offers responsibility and advancement. P-4867, Engineering News-Record.

STRUCTURAL ENGINEER for design and estimating of buildings and bridges who has had design experience with steel fabricator. Also need checkers. The Midwest Steel & Iron Works Co., P.O. Box 5384, Terminal Annex Station, Denver, Colorado.

(Continued on opposite page)

PROJECT MANAGER

For Proposed Mediterranean Work
Two Years Service

Should have prior off-shore administrative experience with U. S. Corps of Engineer Procedure

Project Scope: Heavy grading, underground & surface utilities, pavements, permanent military housing & buildings all types—electric installations—industrial piping.

P4923, Engineering News Record
520 N. Michigan Ave., Chicago 11, Ill.

EXPRESSWAY ENGINEERS WANTED

Midwest engineering firm has openings for one experienced expressway engineer capable of supervising all phase of the design of a modern toll road, one experienced specification writer, two experienced highway bridge engineers, one engineer experienced in highway drainage problems, and one engineer experienced in the design of interchanges. Complete information on background, work history, salary, etc. requested. All replies held strictly confidential.

P-4977, Engineering News-Record
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

(Continued from opposite page)

EXPERIENCED BUILDING Construction Superintendent for long established expanding Eastern Pennsylvania firm. Excellent permanent opportunity. Salary plus bonus. State experience, personal data and minimum base salary. P-4862, Engineering News-Record.

MECHANICAL ENGINEER—Reg. P.E. 5 years minimum experience in design and specifications; Heating, Plumbing and Air Conditioning. Good Salary. Excellent future for qualified man 30-35. Permanent position. Interview arranged on basis of letter stating qualifications and salary desired. P-4861, Engineering News-Record.

WANTED EXPERIENCED Estimator for small structural steel fabricator. Reply with complete resume and salary expected. Berger Steel Co., Lafayette, Ind.

CHIEF ENGINEER with well established company specializing in design and construction of modern cement manufacturing plants. Exceptional opportunity for right party with good background in this field. Location middle West. P-4833, Engineering News-Record.

BRIDGE—HIGHWAY Engineers—Designers—Draftsmen. For work on bridges, expressways and turnpikes. Location Midwest. Permanent positions with periodic promotions depending on experience and ability. Paid vacations, sick leave, hospitalization and life insurance. Include education, experience, reference and salary expected in application letter. P-4968, Engineering News-Record.

PURCHASING AGENT. Requires heavy experience in purchase of reinforced concrete, structural steel and construction equipment, preferably for the oil and chemical industries. Engineering training desirable but not essential. Please write complete details in confidence, including initial salary desired. Advt. box #550. Room 1201, 230 West 41 St, New York 36, N. Y.

DRAFTSMAN, STRUCTURAL detailer thoroughly experienced in bridge and building work. This is a permanent job with a medium sized old established fabricator. All employee benefits, paid vacation, insurance, etc. Reply by letter stating experience, etc., to St. Joseph Structural Steel Co., Box 68, Station A, St. Joseph, Mo.

WANTED YOUNG engineer to do design and layout work for precast products plant in Central Pa., now entering pre-stress field. Must be ambitious, possess business ability, and desire to keep abreast of present day precast and prestress designs. Reply P-4915, Engineering News-Record.

SALESMEN TO sell First aid cabinets to construction firms, contractors, high commission, many territories open. P-4966, Engineering News-Record.

BRIDGE DESIGNERS wanted by long established consulting engineer. Unusual opportunities for experienced men. Prompt promotion for younger men. Give education, experience, references and salary expected. P-4912, Engineering News-Record.

STRUCTURAL ENGINEER

We have an unusual opportunity for a graduate design engineer to serve as a consultant with the sales and application engineering department of a strong manufacturer of structural building products. He should be under 45 and have 10 to 20 years design experience on large commercial and industrial structures, as well as the ability to transmit ideas to others. Initial compensation will include a salary of $8-10,000; company car; bonus; and many fringe benefits. If interested, forward two resumes, in confidence to: Tomsett Associates, Management Personnel Counselors, 431 Frick Bldg., Pittsburgh 19, Pa. *Client assumes our fee.*

POSITIONS VACANT

CHIEF ESTIMATOR — Philadelphia general contractor needs outstanding man. Must have extensive experience with foundation work, reinforced concrete, and all types of industrial buildings. Submit resume and salary desired. Robert E. Lamb & Son, Inc., 3429 W. Indiana Ave., Phila. 32, Pa.

ESTIMATOR FOR general contractor operating in northeast Ohio. Capable of estimating engineering type jobs up to $1,000,000 in size. Give complete information first letter. P-4941, Engineering News-Record.

WANTED: TWO structural steel detailers and designers with experience. Positions permanent. P-4962, Engineering News-Record.

WATER WORKS Engineer — City of Minneapolis, Minnesota. Opening about May, 1955. Salary $738-857 per mo. Applications for civil service examination must be on file by February 1, 1955. For further details and applications write Civil Service Commission, 109 City Hall, Minneapolis, Minn.

STRUCTURAL DETAILER wanted. Send resume to El Paso Machine Works Inc. 1600 E. 4 St., El Paso, Texas.

SELLING OPPORTUNITY OFFERED

SALES TRAINER—Nationally-known company engaged in the manufacture and distribution of fabricated metal products has opening in New York City office for sales correspondent with civil engineering degree. SW-4692, Engineering News-Record.

POSITIONS WANTED

OFFICE MANAGER familar all phases construction contracting business. Many years experience large projects Branch Offices Latin America. Speaks, reads, writes Spanish. Available immediately. PW-4525, Engineering News-Record.

CONSTRUCTION EXECUTIVE, available as project manager, on large operation, chief estimator for large organization or in other executive position where scope warrants employment of top man, thoroughly experienced on all types of construction and in every phase of general contracting. PW-4807, Engineering News-Record.

CONSTRUCTION ENGINEER—Graduate C.E. with Master's degree in structures. Varied experience in field and as estimator. Will consider any opportunity in heavy construction or sales. Will relocate, Age 30. PW-4859, Engineering News-Record.

CONSTRUCTION EXECUTIVE—Engineer, Age 40, 18 yrs. experience Hy. construction, industrial training course, well experienced in shop and factory methods, know machinery and construction equipment well, completing 8 yrs. of administration and supervision of factory construction for large corporation. Excellent costs, safety, work quality and completion records on all projects. Best references. Seeking position in construction field or in a business that needs an executive-engineer. PW-4889, Engineering News-Record.

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PW-4948, Engineering News-Record
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EQUIPMENT MANAGER for large contractor available in Feb. PW-4967, Engineering News-Record.

GRADUATE CIVIL ENGINEER. 2 years experience estimating and field work. Building construction. PW-4963, Engineering News-Record.

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1—Link-Belt Model LS-80, ¾-yard crawler backhoe-clamshell combination with General Motors 4-cylinder diesel engine..... $4900.00

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Sealed bids for the sale of a 1,000,000 gallon elevated steel water tank will be received until 2:30 P.M. Eastern Standard Time, February 17, 1955 by the Water and Sewer Board of the City of Miami at its regular place of meeting at 3342 Pan American Drive, Miami, Florida, at which time and place all bids will be publicly opened and read. The Board reserves the right to reject any or all bids. The purchaser shall dismantle and remove the tank at his own expense.

The tank is located at S.W. 11th Street and S.W. 24th Avenue, Miami, and is accessible for heavy equipment. It was built in 1926, is a riveted tank with ellipsoidal bottom, vertical shell, conical roof and balcony. The tank diameter is fifty-six feet and the riser diameter is ten feet. From top of foundations it is eighty feet to ellipsoidal bottom, ninety-eight feet to bottom of vertical shell and one hundred and forty feet to the overflow. The tank has been well maintained.

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8—Late model Ford Pick-ups, equipped with practically new 2-way Motorola radios.

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Rebuilt Marion Comb. Drag Line-Shovel, Model 372, AIR controls, Serial 8271, 1-¾ cu. yd. 33" wide track, powered by Caterpillar Diesel Engine, Model D-13000, 2 cyl gasoline starting engine; shovel attachment, 23' boom, 181 dipper stick and 1-½ cy yd bucket; crane boom, 25' bottom section, 25' top section, two 10' center sections, one 15' jib with jib support, 40-ton hook block; fairlead; light plant, Kohler 1.5 kw 110 volt; several thousand dollars extra new parts. Loaded truck or common carrier, f.o.b. Alabama shipping point. $27,500.00

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Pitcast—Reconditioned.

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750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-8	1000	327	175	General Motors	12-71	275	1800
600	General Motors	12-567	860	600	150	Worthington	CC-4	225	450
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
500	Alco	6-12jx13T	750	600	148	Fairbanks Morse	32E14	220	300
350	Baldwin	VO-6	510	450	100	General Motors	3-268A	150	1200
320	Enterprise	D8G-6	460	450	60	General Motors	6-71	90	1200

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435 CFM 100 "Unitaire" Joy WL-60 75 HP Elec
552 CFM 125 13/8½x10 Ingersoll 100 HP Elec
560 CFM 125 psi 2 stage Chicago PB8 100 HP Elec
782 CFM 110 psi 15½/9¾x10 Worth DC-2 125 HP Elec
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Albert Pipe Supply Co., Inc. 138
Amburden Dam Co., Inc. 141
American Air Compressor Corp. 139
Arabian American Oil Co. 136

Bement Equipment Co., H. D. 141
Borders Machinery Alex. 138
Boyer, R. H. 139
Buff 142

Campanella & Cardi Construction Co. . 140
Charter Oak Construction Co., Inc. ... 138
Columbia Construction Co., Inc. 141
Consolidated Western Steel Div. 136
Construction Improvements Ltd. 140
Contractors Machinery Co. 139, 140

Dallavia Co., The 137
Deatherage & Son, G. E. 137
Dougherty Co., A. L. 138, 139, 141
Drachman Steel Corp., Hy. 141

Forsythe Equipment Co., Inc. 139, 140
Foster Co., L. B. 140
Frank, M. K. 141
Frantz Equipment Co. 138
Frazier-Davis Construction Corp. . 139, 140

Gillis & Co. 141
Greenpoint Iron & Pipe Co. 138
Greensburg Machine Co. 139

Hickerson, Roy D. 142
Hughes Bros., Inc. 141

Inland Steel Products Co. 136

Los Angeles, County of 136

Mason & Bacon 140
McCarrick Brothers 141
Miami, City of 138
Midwest Steel Corp. 141
Mississippi Valley Equipment Corp. 139, 140
Montgomery Engineering Co. 137
Morrison Railway Supply Co. 141

Rayonier, Inc. 136

Schoonmaker Co., Inc., A. G. 139
Sherman Transfer Co., Roger 141

Tagco, Inc. 138
Tamblyn System 137
Tomsett Associates 137

Warren-Knight Co. 142
Weiss Co., B. M. 139
White Co., David 142
Williams Construction Co. 137, 141
Wilson Engineering Co. 137

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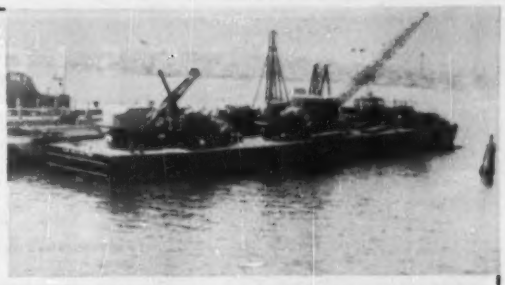

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Acker Drill Co. 133
Aero Service Corp. 39
Allied Structural Steel Companies 132
Allis-Chalmers Mfg. Co. (Tractors) ..40, 41
American Bitumuls & Asphalt Co. 53
American Bridge Div., U. S. Steel Corp. 85
American Map Co. 110
American Mutual Liability Ins. Co. ..72, 73
American Pipe & Construction Co. 125
Armco Drainage & Metal Products, Inc. .....2nd Cover, 93

Baldwin-Lima-Hamilton Corp. 89
Barber-Greene Company 77
Barco Mfg. Co. 87
Belmont Iron Works 112
Bethlehem Steel Co. 81
Blaw Knox Equipment Div., Blaw Knox Co. 29
Borden Metal Products 22
Bucyrus-Erie Co. 11
Butler Bin Co. 126
Byers Co., A. M. 113

Caterpillar Tractor Co. 78, 79
Celotex Corp., The 47
Cement Gun Company 104
Chrysler Corp. 122
Chrysler Corp., Industrial Engine Div. .. 129
Clark Equip. Co., Construction Machinery Div. 83

Dodge Div., Chrysler Corp. 107
Dudgeon, Inc., Richard 123

Economy Form Corp. 128
Eimco Corp., The 117

Fairbanks-Morse Co. .....3rd Cover
Federal Telephone & Telegraph Corp. .. 68
Flintkote Co., The 12
Foster Co., L. B. 50

General Motors Corp. 54
Griffin Wellpoint Corporation 128
Gunite Concrete & Construction Co. 131
Gurley, W. & L. E. 76

Harnischfeger Corporation 34, 35
Hendrix Mfg. Co. 51
Huber Warco Co. 63

Ingalls Iron Works Co. 105
Ingersoll Rand Co. 118
International Harvester Co. (Trucks) 103
Irving Subway Grating Co. 100

Jones & Laughlin Steel Corp. 10
Joy Mfg. Co. 127

Keasbey & Mattison Co. 60
Kern Instrument Co. 52
Kerrigan Iron Works Inc. 102

Lenker Mfg. Co. 80
LeTourneau-Westinghouse Co. 4, 5
Lone Star Cement Corp. 16

MacArthur Concrete Pile Co. 123
MacWhyte Co. 32
Madsen Iron Works, Inc. 134
Maginniss Power Tool Co. 130
Maintenance Co., Inc. 131
Manitowoc Engineering Works 64
Marion Osgood General Co. 115
Maxon Construction Co., Dumpcrete Div. 112
McConnaughay, K. E. 88
McKiernan-Terry Corp. 123
McMillan Co. 116
Molco Drilling Machines, Inc. 2
Moretrench Corp. 114

Northwest Engineering Company 3

Owen Bucket Company 8

Page Engineering Co. 116
Pennsylvania Drilling Co. 114
Pettibone Mulliken Corp. 36
Phoenix Bridge Co. 114
Pioneer Engineering Works 101
Portland Cement Assn. 45

Raymond Concrete Pile Co. 9
Rockford Clutch Div., Borg-Warner 104
Roebling's Sons Corp., John A. 70
Ryerson & Sons, Inc., Jos. T. 14

Scarborough Contr. Corp. 114
Seaman Motors 111
Servicised Products Corp. 124
Shell Oil Co. 66, 67
Sika Chemical Corp. 131
Sinclair Refining Co. 1
Smith Barney Co. 48
Smith Co., S. Morgan 82
Soiltest Inc. 130
Sonoco Products Co. 108, 109
Sprague & Henwood, Inc. 112
Standard Dry Wall Products 84
Standard Oil of Indiana 95
Superior Concrete Accessories 86
Symons Clamp & Mfg. Co. 133

Taller & Cooper, Inc. 98
Texas Company .....4th Cover, 6, 7
Timken-Detroit Axle Co. 90, 91
Timken Roller Bearing Co. 26
Tinney Drilling Company 116
Tousey Varnish Co. 121

Unit Crane & Shovel Corp. 119
U. S. Steel Corp. 56, 57
Universal Sewer Pipe Corp. 43

Young & Greenawalt 110

Professional services 142

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

Employment 136, 137
Educational 137
Notices
Proposal 133-136
Equipment
(For Rent, Sales, Wanted)..137-142

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Adequate Roads in Our Time

SELDOM IN THE HISTORY OF NATIONS has a country's economic future hinged so clearly on the answer to a single question as it does now for the United States in deciding whether or not it wants adequate roads badly enough to pay for them. Grown great by adhering to the theory of an expanding economy, in which highway transport plays a dominant role, this country plainly sees its economy blocked from future growth by traffic-choked roads. Either the roads must be made adequate for the traffic or the end of national expansion as we know it must be accepted.

The decision is one that Congress must face in a matter of weeks when it receives President Eisenhower's ideas on the subject. It is also a decision that each of the state legislatures must make in its own way before the year is out.

FORTUNATELY, the nature and scope of the problem can be drawn and the means for its solution forseen. Thus it is that a major part of this issue is given over to an appraisal of our highways and of our capacity to correct their inadequacies, which the President has said can be done in ten years by a $50 billion increase in road-building expenditures.

None of the extensive studies on which this report is based revealed any serious shortages in the things needed actually to carry out such an enormous increase in roadbuilding—materials, equipment, labor, know-how—with the possible exception of enough engineers for speedy design and proper supervision. The chief problems are legislative and educational—selling the need for a greatly expanded program to members of Congress and to the 48 state legislatures who must cooperate if the entire program is to be given concrete form.

It was the states, acting through their state highway departments, that determined how big the roadbuilding program should be to give this country by 1964 a highway system that would be adequate until 1974. They came up with a figure of $101 billion, which meant that, roughly, $50 billion would have to be spent in addition to what we have already made provision to spend on highways in the next 10 years. That is where the President got the figure that he set as an objective of a "grand plan" for a modern highway network.

Since that objective was set, the President's highway advisors have concluded that the federal share of the expanded program should be limited to the cost of bringing the interstate system—the nation's basic 40,000-mile highway network—up to standard. That work is estimated to cost $26 billion. Hence, if the entire objective is to be attained, the states, collectively, must furnish the remaining $24 billion in addition to what they will have to provide to keep the regular road construction and maintenance program going forward at the current rate.

That is the part of the grand plan that must be sold to the state legislatures. Some of the governors already are sold, which will be a great help. A few states have agencies in being that can issue bonds secured by revenue from gasoline taxes or similar sources. Some states can issue bonds, but others with prohibitions against borrowing or with strict debt limits have no easy route. They will have to set up special authorities to finance work that cannot be financed out of current income.

In all but a few instances toll financing will be out of the question because most highways with sufficient volume of traffic to justify tolls are on the interstate net, where all work probably will be paid for by the federal government.

One disadvantage of having the federal government foot the entire bill for work on the interstate system is that this will release a considerable amount of money in some states for use on other federal-aid highways and on state and local roads. That will complicate the problem of convincing economy-minded legislators of the need for raising still more money for still more construction on those same roads.

WHAT ABOUT CONGRESS? There will be changes in committees on public works and subcommittees on roads that make it difficult to predict confidently what stand those committees will take. However, most Congressmen appear to recognize the need for a greatly expanded road program. Also, General Lucius Clay, chairman of the President's special highway committee, has been devoting much of his time to enlisting the support of members of Congress or of people whose opinions carry weight with Congress.

Trouble, nevertheless, may develop in Congress over the methods of financing the expanded program. Some members sincerely believe that the necessary borrowing should be part of the public debt and not divorced from future budget-balancing efforts by the expedient of issuing revenue bonds backed by future federal gas taxes.

Proposals such as this could delay action on the new highway program in Congress, but, in view of the economic consequences, cannot be expected to prevent its adoption. Nevertheless, all those who fully recognize the great need for doubling our road-building program without delay should lose no opportunity to sell that need to Congress first and then to the state legislatures. For it is only by prompt action that we can have adequate roads in our time—and an assurance of continued national economic expansion.

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NEW YORK STATE

An example of all-flexible construction on State Route 52. A 3-in. Texaco Asphaltic Concrete surface was laid on a 12-in. broken stone base, the top 4 inches penetrated with Texaco Asphalt. Underneath is a 12-in. sub-base of gravel.

MASSACHUSETTS

State Route 15 owes its complete flexibility to a 2½-in. wearing surface of hot-mix Texaco Asphaltic Concrete, a 4½-in. Asphalt (Penetration) Macadam base and a 12-in. gravel sub-base.

PENNSYLVANIA

To give this section of U. S. Route 122 top-to-bottom flexibility, Pennsylvania employed a 2¼-in. Texaco Asphaltic Concrete wearing surface, which is supported by 10 inches of water-bound macadam.

KENTUCKY

For this all-flexible State Highway project in Louisville, the entire 12-in. thickness of foundation and wearing surface consists of a series of layers of plant-mixed Texaco Asphaltic Concrete.

VIRGINIA

A 1½-in. plant-mixed Texaco Sand Asphalt top course, a 5-in. base of hot-mix Texaco Asphaltic Concrete and a 6-in. clay-gravel sub-base are the components of this all-flexible project on State Highway 147.

All-flexible Highways

from subgrade to wearing surface

The important advantage of an all-flexible Texaco Asphalt highway is its ability to maintain complete contact with the supporting subgrade at all times. When settlement occurs anywhere in the subgrade, the flexible foundation and surface settle too. Consequently, every square yard of the flexible pavement continuously utilizes the full load-bearing capacity of the subgrade.

In terms of highway performance, this subgrade-to-surface flexibility enables highways of this type to withstand traffic impact years longer, at the same time holding upkeep costs down to a minimum.

The wearing surface of a flexible-type highway may be one of the plant-mixed Texaco Asphalt types, including Asphaltic Concrete and Sand Asphalt. The foundation, too, may be plant-mixed Texaco Asphaltic Concrete or Sand Asphalt, or it may be Asphalt (Penetration) Macadam.

Helpful information concerning methods and materials used in the various plant-mixed types of Texaco Asphalt construction and Asphalt (Penetration) Macadam is supplied in two booklets, which can be secured without charge or obligation by writing our nearest office. The same booklets also describe low-cost types of asphalt construction which are suitable for secondary roads and streets.

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